



DOCUMENTATION

**FEMP HVAC UPGRADE PROJECTS
FORT RILEY, KANSAS**

Prepared for

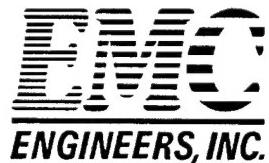
**U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT
KANSAS CITY, MISSOURI**

Under

CONTRACT NO. DACA01-94-D-0033

May 1995

19971016 182



E M C ENGINEERS, INC.
2750 S. Wadsworth Blvd., Suite C-200
Denver, Colorado 80227
303/988-2951

DISSEMINATION STATEMENT A

Approved for public release;
Distribution Unrestricted

DTIG QUALITY INSPECTED 2

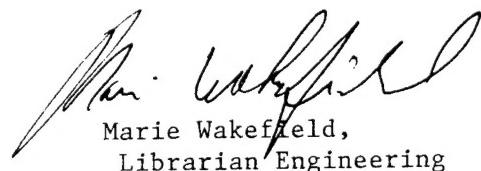


DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

--
REPLY TO
ATTENTION OF: TR-I Library

17 Sep 1997

Based on SOW, these Energy Studies are unclassified/unlimited.
Distribution A. Approved for public release.



Marie Wakefield,
Librarian Engineering

TABLE OF CONTENTS

- | | |
|---------------|--|
| Project No. 1 | Upgrade HVAC Systems in Dental Clinics,
Buildings 602, 7665, and 7670 |
| Project No. 2 | Upgrade HVAC Systems in Dining Facilities
Buildings 7245, 7606, and 7654 |
| Project No. 3 | Upgrade HVAC Systems in Indoor Swimming Pools
Buildings 6940 and 8069 |
| Project No. 4 | Upgrade HVAC Systems in Bowling Alley and Community
Activities Center
Building 7485, Bowling Alley
Building 6620, Community Activities Center |
| Project No. 5 | Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor
Pool Admin, and Battalion Headquarters
Building 5000, Fire Station
Building 7086, Unit Chapel
Building 7178, Motor Pool Admin.
Building 7806, Battalion Headquarters |

FEMP Project No. 1

Upgrade HVAC Systems in Dental Clinics
Buildings 602, 7665, and 7670

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		4. PROJECT TITLE Upgrade HVAC Systems in Dental Clinics		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Upgrade HVAC Systems in Dental Clinics	LS			79
TOTAL CONTRACT COST				79
SIOH (5.5%)				4
DESIGN COST (6.0%)				5
TOTAL PROJECT COST				88
Total Request (Rounded)				90
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the dental clinics, Buildings 602, 7665, and 7670. The HVAC system upgrades include the following:				
<ul style="list-style-type: none"> Convert the existing dual duct air handling unit (AHU) serving Building 602 to a variable-air-volume (VAV) AHU. A variable speed drive (VSD) will be installed to control the supply fan speed. The existing dual duct mixing boxes will be replaced with dual duct VAV terminal units. The existing ductwork will remain. Convert the existing multizone AHU serving Building 7665 to a VAV AHU. A VSD will be installed to control the supply and return fan speed. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Convert the existing dual duct AHU serving Building 7670 to a VAV AHU. A VSD will be installed to control the supply and return fan speed. The existing dual duct mixing boxes will be replaced with dual duct VAV terminal units. The existing ductwork will remain. 				
11. REQUIREMENT:				
<p>Project: This Federal Energy Management Program (FEMP) project will convert the existing dual duct and multizone AHUs to VAV AHUs in the dental clinics, Buildings 602, 7665, and 7670.</p> <p>Requirement: This project is required to reduce the natural gas and electrical consumption of the existing dual duct and multizone AHUs by reducing their air flow rates through VAV technology. An immediate utility savings would be recognized.</p> <p>Current Situation: The dental clinic buildings are single story buildings with the following floor areas and HVAC system types:</p> <ul style="list-style-type: none"> Building 602 is a 11,560 sq ft building and is heated and cooled by a dual duct AHU. Building 7665 is a 11,080 sq ft building and is heated and cooled by a multizone AHU. Building 7670 is a 14,960 sq ft building and is heated and cooled by a dual duct AHU. 				

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA		2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			
4. PROJECT TITLE Upgrade HVAC Systems in Dental Clinics		5. PROJECT NUMBER	

11. REQUIREMENT (continued):

Impact if Not Provided: If this project is not funded, a reduction of 1,459 MBtu/yr (1,537,778 MJ/yr) cannot be achieved. The Army will not realize a \$23,779 annual energy dollar savings with a 3.7 year simple payback and a savings-to-investment ratio (SIR) of 4.22. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.

Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.

Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.

Amount of Energy Conserved: The amount of energy conserved is estimated to be 1,459 MBtu per year (1,537,778 MJ/yr).

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Upgrade HVAC Systems in Dental Clinics		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/23/95	ECONOMIC LIFE:	20	PREPARED BY:	A. Niemeyer

1. INVESTMENT:	Dental Clinic Buildings 602, 7665, and 7670 - Convert DD AHUs and MZ AHU to VAV AHUs				
A. CONSTRUCTION COST	=				\$78,841
B. SIOH COST	(5.5% of 1A) =				\$4,336
C. DESIGN COST	(6.0% of 1A) =				\$4,730
D. TOTAL COST	(1A + 1B + 1C) =				\$87,908
E. SALVAGE VALUE OF EXISTING EQUIPMENT =					\$0
F. PUBLIC UTILITY COMPANY REBATE =					\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =				-----> \$87,908

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	1,871	\$22,639	15.88	\$359,509
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(412)	(\$1,697)	18.30	(\$31,063)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$2,837	14.88	\$42,215
F. TOTAL		1,459	\$23,779	----->	\$370,660

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE		\$0	14.88	\$0
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST		\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$23,779

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 3.70

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$370,660

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 4.22
(MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 1

Upgrade HVAC Systems in Dental Clinics
Buildings 602, 7665, and 7670

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION:	2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade			FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: **BLDG 602 - Convert DD AHUs to DDs with VAV Units**

A. CONSTRUCTION COST	=	\$31,697
B. SIOH COST	(5.5% of 1A) =	\$1,743
C. DESIGN COST	(6.0% of 1A) =	\$1,902
D. TOTAL COST	(1A + 1B + 1C) =	\$35,342
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$35,342

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	681	\$8,237	15.88	\$130,809
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(132)	(\$546)	18.30	(\$9,984)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$1,242	14.88	\$18,480
F. TOTAL		548	\$8,934	----->	\$139,305

3. NON-ENERGY SAVINGS (+) OR COST (-)
 - A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

 - B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =	\$0
--	----------------	-----

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$8,934
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 3.96
6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$139,305
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 3.94
 (MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

			SHEET 1 OF 1		
			DATE PREPARED 22-May-95		
			ESTIMATOR C. Wohlert		
			CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
			Quantity	Unit Cost	Total
				Crew/ Worker	Hours/ Unit
				Total	TOTAL
1	2	BUILDING 602 PROPOSED SYSTEM MODIFICATIONS			
3	4	VARIABLE SPEED DRIVE W/ CONTRLER, 25HP	EA.	\$5,426.40	1-ELEC
5	6	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE COPPER WIRING #12	EA.	\$24.23	1-ELEC
7	8	VAV BOX, 500 CFM, ELEC VAV BOX, 800 CFM, ELEC	EA.	\$7.41	1-ELEC
9	10	VAV BOX, 1200 CFM, ELEC VAV BOX, 2000 CFM, ELEC	EA.	\$327.00	1-SHEE
11	12		EA.	\$331.40	1-SHEE
13	14		EA.	\$334.30	1-SHEE
15	16		EA.	\$345.90	1-SHEE
17	18				
19	20				
21	22				
23	24				
25	26	EXISTING SYSTEMS DEMOLITION DUAL DUCT MIXING BOX DEMO	EA.	44.0	1-SHEE
27	28				3 \$2,747
29	30				
31	32	SUBTOTAL OVERHEAD		\$15,569	\$4,990
33	34	PROFIT CONTINGENCY		\$2,616 10% 20%	\$838 \$583 \$4,001
35		TOTAL COST		\$24,003	\$1,282 \$7,694

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION:	2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade			FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7665 - Convert Existing MZ to VAV AHUs					
A. CONSTRUCTION COST	=			\$10,951	
B. SIOH COST	(5.5% of 1A) =			\$602	
C. DESIGN COST	(6.0% of 1A) =			\$657	
D. TOTAL COST	(1A + 1B + 1C) =			\$12,210	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =				\$0	
F. PUBLIC UTILITY COMPANY REBATE =				\$0	
G. TOTAL INVESTMENT	(1D -1E -1F) =			----->	\$12,210
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	301	\$3,637	15.88	\$57,752
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(107)	(\$440)	18.30	(\$8,046)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$637	14.88	\$9,479
F. TOTAL		194	\$3,834	----->	\$59,185
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0	
b.				\$0	
c.				\$0	
d. TOTAL	\$0			\$0	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bd4) =				\$0
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
(2F3 + 3A4 + (3Bd1/Economic Life))					
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =				3.18
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =				\$59,185
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)	(6/1G) =				4.85

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

			SHEET 1 OF 1	DATE PREPARED 22-May-95	ESTIMATOR C. Wohlert	CHECKED BY A. Niemeyer
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	
			Quantity	Unit Cost	Total	Hours/ Unit
1	2	BUILDING 7665 PROPOSED SYSTEM MODIFICATIONS				
2	3	VARIABLE SPEED DRIVE W/ CONTROLLER, 15HP SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$4,060.11	1-ELEC
3	4	E-TSTAT1 WIRE#12 VAVBX12 VAVBX24 VAVBX70 ELE-SWIT	EA.	6.0	\$24.23	1-ELEC
4	5	VSD15 COPPER WIRING #2 VAV BOX, 1200 CFM, ELEC VAV BOX, 2400 CFM, ELEC VAV BOX, 7000 CFM, ELEC DDC SWITCH	C.L.F.	7.0	\$7.41	1-ELEC
5	6		EA.	2.0	\$271.32	1-SHEE
6	7		EA.	2.0	\$287.31	1-SHEE
7	8		EA.	2.0	\$353.69	1-SHEE
8	9		EA.	1.0	\$69.77	1-STPI
9	10					
10	11					
11	12					
12	13					
13	14					
14	15					
15	16					
16	17					
17	18					
18	19					
19	20					
20	21					
21	22					
22	23					
23	24					
24	25					
25	26	EXISTING SYSTEMS DEMOLITION ZONE DUCTWORK DEMOLITION	EA.	6.0		1-SHEE
26	27					
27	28					
28	29					
29	30					
30	31					
31	32	SUBTOTAL OVERHEAD PROFIT CONTINGENCY				
32	33					
33	34					
34	35					
35		TOTAL COST				

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7670 - Convert DD AHUs to DDs with VAV Units

A. CONSTRUCTION COST	=	\$36,193
B. SIOH COST	(5.5% of 1A) =	\$1,991
C. DESIGN COST	(6.0% of 1A) =	\$2,172
D. TOTAL COST	(1A + 1B + 1C) =	\$40,355
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$40,355

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	889	\$10,760	15.88	\$170,875
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(173)	(\$713)	18.30	(\$13,042)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$958	14.88	\$14,255
F. TOTAL		716	\$11,006	----->	\$172,088

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =		\$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$11,006

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 3.67

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$172,088

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 4.26
(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 7670							SHEET 1 OF 1
			DATE PREPARED 22-May-95				
			ESTIMATOR C. Wohlert				
			CHECKED BY A. Niemeyer				
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST	
					Unit Cost	Hours/ Unit	Total
1		BUILDING 7670					TOTAL
2		PROPOSED SYSTEM MODIFICATIONS					
3	VSD15	VARIABLE SPEED DRIVE W/ CONTRLER, 15HP	EA.	1	\$4,060.11	1-ELEC	\$795
4	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	50	\$24.23	1-ELEC	\$837
5	WIRE#12	COPPER WIRING #12	C.L.F.	10	\$7.41	1-ELEC	\$727
6	VAVBX5	VAV BOX, 500 CFM, ELEC	EA.	36	\$327.00	1-SHEE	\$152
7	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	7	\$331.40	1-SHEE	\$1,109
8	VAVBX12	VAV BOX, 1200 CFM, ELEC	EA.	2	\$334.30	1-SHEE	\$219
9	VAVBX20	VAV BOX, 2000 CFM, ELEC	EA.	5	\$345.90	1-SHEE	\$739
10							\$1,920
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25		EXISTING SYSTEMS DEMOLITION					
26		DUAL DUCT MIXING BOX DEMO					
27							
28							
29							
30							
31	OH	SUBTOTAL					
32	PRO	OVERHEAD					
33	CONT	PROFIT					
34		CONTINGENCY					
35		TOTAL COST					

FEMP Project No. 2

Upgrade HVAC Systems in Dining Facilities
Buildings 7245, 7606, and 7654

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		4. PROJECT TITLE Upgrade HVAC Systems in Dining Facilities		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Upgrade HVAC Systems in Dining Facilities	LS			558
TOTAL CONTRACT COST				<u>558</u>
SIOH (5.5%)				31
DESIGN COST (6.0%)				<u>33</u>
TOTAL PROJECT COST				622
Total Request (Rounded)				625
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the dining facilities, Buildings 7245, 7606, and 7654. The HVAC system upgrades include the following:				
<ul style="list-style-type: none"> Replace existing single zone air handling units (AHUs) serving the dining areas with variable-air-volume (VAV) AHUs. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Replace existing make-up air handling units (MAUs) serving the kitchen areas with heat recovery air handling units (HRUs). The exhaust fans interlocked with the MAUs will be removed. Exhaust air ductwork will be provided at the roof exhaust air outlets and connected to the inlets on the HRUs. Replace the existing steam boiler serving both space heating and service water heating with separate boilers for each of the loads. An energy efficient hot water boiler will be installed for space heating. An energy efficient steam boiler will be installed for service water heating. 				
11. REQUIREMENT:				
<p>Project: This Federal Energy Management Program (FEMP) project will replace the following HVAC systems in the dining facilities, Buildings 7245, 7606, and 7654:</p> <ul style="list-style-type: none"> Replace the existing single zone AHUs with VAV AHUs Replace the MAUs with HRUs Replace the steam boiler serving both space and service water heating loads with separate boilers for each load. 				
<p>Requirement: This project is required to reduce the natural gas and electrical energy consumption of the existing single zone AHUs by replacement with VAV AHUs, of the existing MAUs by replacement with HRUs, and of the existing steam boiler by replacement with smaller energy efficient boilers. An immediate utility savings would be recognized.</p>				
<p>Current Situation: The dining facilities are single story, 14,000 sq ft buildings with single zone AHUs serving the dining areas, MAUs serving the kitchen areas, and a large steam boiler serving the space heating and service water heating loads.</p>				

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA		2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			
4. PROJECT TITLE Upgrade HVAC Systems in Dining Facilities		5. PROJECT NUMBER	

11. REQUIREMENT (continued):

Impact if Not Provided: If this project is not funded, a reduction of 15,117 MBtu/yr (15,933,318 MJ/yr) cannot be achieved. The Army will not realize a \$71,100 annual energy dollar savings with a 6.65 year simple payback and a savings-to-investment ratio (SIR) of 2.66. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.

Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.

Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.

Amount of Energy Conserved: The amount of energy conserved is estimated to be 15,117 MBtu per year (15,933,318 MJ/yr).

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Upgrade HVAC Systems in Dining Facilities		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/24/95	ECONOMIC LIFE:	20	PREPARED BY:	A. Niemeyer

1. INVESTMENT: Dining Facilities Buildings 7245, 7606, and 7654 - Replace SZ AHUs with VAV AHUs; Replace MAUs with HRUs; Replace Large Steam Boiler with Smaller HW Boiler and Steam Boiler					
A. CONSTRUCTION COST	=			\$558,179	
B. SIOH COST	(5.5% of 1A) =			\$30,700	
C. DESIGN COST	(6.0% of 1A) =			\$33,491	
D. TOTAL COST	(1A + 1B + 1C) =			\$622,370	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =				\$0	
F. PUBLIC UTILITY COMPANY REBATE =				\$0	
G. TOTAL INVESTMENT	(1D -1E -1F) =			----->	\$622,370
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	837	\$10,128	15.88	\$160,828
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	14,280	\$58,834	18.30	\$1,076,655
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$2,139	14.88	\$31,828
F. TOTAL		15,117	\$71,100	----->	\$1,269,311
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			(\$543)	14.88	(\$8,080)
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			(\$543)		(\$8,080)
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED AVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$460,107	5	0.863	\$397,072	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$460,107			\$397,072	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =			\$388,993
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
		(2F3 + 3A4 + (3Bf1/Economic Life))			\$93,563
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)					
		(1G/4) =			6.65
6. TOTAL NET DISCOUNTED SAVINGS					
		(2F5 + 3C) =			\$1,658,304
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)					
		(6/1G) =			2.66
(MUST HAVE SIR > 1.25 TO QUALIFY)					

FEMP Project No. 2

Upgrade HVAC Systems in Dining Facilities
Buildings 7245, 7606, 7654

Backup Data

**LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)**

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7245 - Replace SZs AHUs In Dining area w/ VAV AHUs					
A. CONSTRUCTION COST	=			\$29,943	
B. SIOH COST	(5.5% of 1A) =			\$1,647	
C. DESIGN COST	(6.0% of 1A) =			\$1,797	
D. TOTAL COST	(1A + 1B + 1C) =			\$33,387	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =				\$0	
F. PUBLIC UTILITY COMPANY REBATE =				\$0	
G. TOTAL INVESTMENT	(1D -1E -1F) =			----->	\$33,387
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	287	\$3,477	15.88	\$55,214
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(279)	(\$1,151)	18.30	(\$21,054)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$381	14.88	\$5,663
F. TOTAL		8	\$2,707	----->	\$39,823
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$21,050	5	0.863	\$18,166	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$21,050			\$18,166	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =				\$18,166
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life))					
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =				8.88
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =				\$57,988
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)	(6/1G) =				1.74

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.
Denver, CO

				SHEET 1	OF 1
				DATE PREPARED 22-May-95	
				ESTIMATOR C. Wohleit	
				CHECKED BY A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
1	2	BUILDING 7245 PROPOSED SYSTEM MODIFICATIONS	Quantity	Unit Cost	Total
3		NEW SYSTEMS INSTALLATION			
4	AHU8000	8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18
5	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23
6	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41
7	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" WI/HANGERS	L.F.	60.0	\$2.95
8		FITTINGS ADD 5%			
9	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40
10	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89
11	VSD5	VARIABLE SPEED DRIVE W/ CONTRLR 5HP	EA.	2.0	\$2,444.79
12	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47
13	DTNSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25		EXISTING SYSTEMS DEMOLITION			
26		AHU DEMO	TON	2.8	
27					
28					
29					
30					
31	OH	SUBTOTAL		\$14,751	
32	PRO	OVERHEAD		\$2,478	
33	CONT	PROFIT		\$1,723	
34		CONTINGENCY		\$3,791	
35		TOTAL COST		\$22,743	

\$1,608
\$33
\$23
\$233
\$12
\$88
\$20
\$879
\$571
\$254
\$20
\$172
\$402
\$5,769
\$711
\$399

\$10,475
\$82
\$34
\$409
\$20

\$1,608
\$33
\$23
\$233
\$12
\$88
\$20
\$879
\$571
\$254
\$20
\$172
\$402
\$5,769
\$711
\$399

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

\$10,475
\$82
\$34
\$409
\$20

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1				DATE PREPARED 22-May-95			
				ESTIMATOR C. Wohlert			
				CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST		
				Unit Cost	Crew/ Worker	Hours/ Unit	Total
				Quantity	Total		TOTAL
1		BUILDING 7245					
2		ANNUAL RECURRING					
3		ANNUAL MAINTENANCE COST - BASELINE					
4							
5	6						
6	7						
7	8						
8	9						
9	10						
10	11						
11	12						
12	13						
13	14						
14	15	TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0	\$0		\$0
15	16	ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT					
16	17						
17	18						
18	19						
19	20						
20	21						
21	22						
22	23						
23	24						
24	25						
25	26						
26	27						
27	28						
28	29	TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0	\$0		\$0
29	30						
30	31						
31	32						
32	33						
33	34						
34	35	TOTAL ANNUAL MAINTENANCE COST SAVINGS		\$0	\$0		\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1			DATE PREPARED 22-May-95		
ESTIMATOR C. Wohleit			CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST
1	2	BUILDING 7245			
3	4	NON-RECURRING			
5	AHU8000	EXISTING SYSTEM REPLACEMENT	EA.	2.0	\$4,433.18
6	DUCT500	8,000 CFM AHU, COOLING ONLY	LB.	300.0	\$0.47
7	E-TSTAT1	GAL. STEEL DUCTWORK, 200 TO 500 LB.	EA.	2.0	\$24.23
8	WIRE#12	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	C.L.F.	1.5	\$7.41
9	STLPIP1.5	COPPER WIRING #12	L.F.	60.0	\$2.95
10		STEEL PIPE SCH. 40, 1.5" WHANGERS	L.F.		
11	INSLPIP1.5	FITTINGS ADD 5%	L.F.		
12	CNTV1	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	EA.	2.0	\$190.89
13	DTINSL1"	CONTROL VALVE 1"	S.F.	300.0	\$0.48
14		DUCT INSULATION, 1" THICK			
15					
16					
17					
18					
19					
20					
21					
22		EXISTING SYSTEMS DEMOLITION			
23		AHU DEMO	TON	2.8	
24					
25					
26					
27					
28					
29					
30					
31		SUBTOTAL			
32		OVERHEAD			
33		PROFIT			
34		CONTINGENCY			
35		TOTAL COST			

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7245 - Replace Kitchen MAUs & Exhaust w/ Heat Recovery Units					
A. CONSTRUCTION COST	=		\$81,017		
B. SIOH COST	(5.5% of 1A) =		\$4,456		
C. DESIGN COST	(6.0% of 1A) =		\$4,861		
D. TOTAL COST	(1A + 1B + 1C) =		\$90,334		
E. SALVAGE VALUE OF EXISTING EQUIPMENT =			\$0		
F. PUBLIC UTILITY COMPANY REBATE =			\$0		
G. TOTAL INVESTMENT	(1D - 1E - 1F) =			----->	\$90,334
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	103	\$1,250	15.88	\$19,853
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,511	\$14,465	18.30	\$264,706
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$332	14.88	\$4,942
F. TOTAL		3,614	\$16,047		-----> \$289,501
3. NON-ENERGY SAVINGS (+) OR COST (-)					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
			(TABLE A-2)		
a. BASELINE EQUIP. REPLCMNT.	\$30,377	5	0.863	\$26,215	
b.				\$0	
c.				\$0	
d. TOTAL	\$30,377			\$26,215	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bd4) =			\$26,215
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bd1/Economic Life))		\$17,566
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)		(1G/4) =			5.14
6. TOTAL NET DISCOUNTED SAVINGS		(2F5 + 3C) =			\$315,716
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)		(6/1G) =			3.49

ENGINEER'S OPINION OF PROBABLE COST

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

				SHEET 1 OF 1	DATE PREPARED 22-May-95	ESTIMATOR C. Wohlert	CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST				
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	Total
1		BUILDING 7245								
2		ANNUAL RECURRING								
3		ANNUAL MAINTENANCE COST - BASELINE								
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE				\$0			\$0	\$0
16										
17		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT								
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE				\$0			\$0	\$0
30										
31										
32										
33										
34										
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS				\$0			\$0	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						
				DATE PREPARED 22-May-95		
				ESTIMATOR C. Wohlert		
				CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	TOTAL
1	2	BUILDING 7245 NON-RECURRING NEW SYSTEMS INSTALLATION	EA.	1.0	\$5,499.08	\$1,049
3	4	AHU12000	EA.	1.0	\$2,519.40	\$2,907
5	5	AHU12000	EA.	1.0	\$1,913.78	\$2,172
6	6	AHU3200	EA.	1.0	\$1,914.00	\$614
7	7	AHU1300	L.F.	90.0	\$2.95	
8	8	STLPIP1.5				
9	9	FITTINGS, 5%				
10	10	CNTV1.5	EA.	3.0	\$276.17	\$828
11	11	INSLPIP1.5	L.F.	90.0	\$1.40	\$126
12	12	DUCT1000	LB.	450.0	\$0.47	\$209
13	13	DTINSL2"	S.F.	700.0	\$0.83	\$583
14	14	EXHOD1.3	EA.	1.0	\$479.66	\$480
15	15	EXHOD11	EA.	1.0	\$1,986.45	\$1,986
16	16	EXHOD3.6	EA.	1.0	\$823.65	\$824
17	17					
18	18					
19	19					
20	20					
21	21					
22	22	EXISTING SYSTEM DEMOLITION	TON	1.0		
23	23	AHU DEMOLITION				
24	24					
25	25					
26	26					
27	27					
28	28					
29	29					
30	30					
31	31	SUBTOTAL				
32	32	OH				
33	33	PRO				
34	34	CONT				
35	35	TOTAL COST				

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7245 - Replace Large STM Boiler w/ Smaller STM & HW Boilers					
A. CONSTRUCTION COST	=		\$65,099		
B. SIOH COST	(5.5% of 1A) =		\$3,580		
C. DESIGN COST	(6.0% of 1A) =		\$3,906		
D. TOTAL COST	(1A + 1B + 1C) =		\$72,585		
E. SALVAGE VALUE OF EXISTING EQUIPMENT =			\$0		
F. PUBLIC UTILITY COMPANY REBATE =			\$0		
G. TOTAL INVESTMENT	(1D - 1E - 1F) =			----->	\$72,585
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	(111)	(\$1,338)	15.88	(\$21,247)
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	1,528	\$6,295	18.30	\$115,205
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		1,417	\$4,957		-----> \$93,958
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			(\$181)	14.88	(\$2,693)
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			(\$181)		(\$2,693)
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
			(TABLE A-2)		
a. BASELINE EQUIP. REPLACEMENT	\$101,942	5	0.863	\$87,976	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$101,942			\$87,976	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =			\$85,284
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bf1/Economic Life))		\$9,874
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)					
			(1G/4) =		7.35
6. TOTAL NET DISCOUNTED SAVINGS					
			(2F5 + 3C) =		\$179,241
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)					
			(6/1G) =		2.47
(MUST HAVE SIR > 1.25 TO QUALIFY)					

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

EMC Engineers, Inc.
Denver, CO

PROJECT				Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1			
ENGINEER				E M C Engineers, Inc.				DATE PREPARED 22-May-95			
C. Wohlert				ESTIMATOR				C. Wohlert			
A. Niemeyer				CHECKED BY				A. Niemeyer			
Line No.	Item Refer Code	Item Description			Unit of Measure	MATERIAL COST			LABOR COST		
		Quantity	Unit Cost	Total		Crew/ Worker	Hours/ Unit	Total			TOTAL
1	2	BUILDING 7245 PROPOSED SYSTEM MODIFICATIONS									
3	4	<i>NEW SYSTEMS INSTALLATION</i>									
5	6	BOILER, STEAM, 2 MBH, 85%	EA.	1.0	\$15,640	\$15,640	Q-7	35.556	\$731	\$16,371	
7	8	BOILER, HOT WATER, 2 MBH, 85% STEEL PIPE SCH. 40, 2" WHANGERS VALVES & FITTINGS, 25%	EA.	1.0	\$16,110	\$16,110	Q-7	32	\$658	\$16,768	
9	10	2" FIBERGLASS PIPE INSULATION, 1.5" THICK STEEL PIPE SCH. 40, 6" WHANGERS FITTINGS, 10%	L.F.	90.0	\$3.91	\$352	Q-1	0.25	\$436	\$789	
11	12	6" FIBERGLASS PIPE INSULATION, 1.5" THICK PUMP, 5 HP	L.F.	90.0	\$1.46	\$132	Q-14	0.084	\$109	\$197	
13	14		L.F.	25.0	\$17.93	\$448	Q-16	0.667	\$139	\$271	
15	16		EA.	1.0	\$1,114.35	\$45	Q-14	0.145	\$36	\$81	
17	18					\$55	Q-1	0.67	\$67	\$121	
19	20					\$1,114	8.889	0.172	\$172	\$1,287	
21	<i>EXISTING SYSTEMS DEMOLITION BOILER DEMOLITION</i>										
22	23										
24	25										
26	27										
28	29										
30	31	SUBTOTAL									
32	33	OVERHEAD									
34	35	PROFIT									
		CONTINGENCY									
		TOTAL COST									
		17%				\$33,984					\$42,224
		10%				\$5,709					\$7,094
		20%				\$3,969					\$4,932
						\$8,733					\$10,850
						\$52,395					\$65,099

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						
			DATE PREPARED		22-May-95	
			ESTIMATOR		C. Wohlert	
			CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST
					Crew/ Worker	Hours/ Unit
				Total	Total	Total
1	2	BUILDING 7245 NON-RECURRING				
3	4	BASELINE - EXISTING EQUIP. REPLACEMENT	EA.	1.0	\$51,357	Q-7
5	5	CAST IRON STEAM BOILER, 6.97 MBH	L.F.	25.0	\$17.93	Q-16
6	6	STEEL PIPE SCH. 40, 6" W/HANGERS			\$48	0.667
7	7	FITTINGS, 10%			\$45	\$36
8	8	6" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	25.0	\$2.18	Q-14
9	9				\$55	0.145
10	10					\$67
11	11					
12	12					
13	13					
14	14					
15	15					
16	16					
17	17					
18	18					
19	19					
20	20	EXISTING SYSTEMS DEMOLITION				
21	21	BOILER DEMOLITION	EA.	1.0		
22	22					
23	23					
24	24					
25	25					
26	26					
27	27					
28	28					
29	29					
30	30					
31	31	SUBTOTAL			\$51,904	\$14,216
32	32	OVERHEAD			\$8,720	\$2,388
33	33	PROFIT			\$6,062	\$1,660
34	34	CONTINGENCY			\$13,337	\$3,653
35	35	TOTAL COST			\$80,024	\$101,918

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7606 - Replace SZs AHUs In Dining area w/ VAV AHUs					
A. CONSTRUCTION COST	=	\$29,943			
B. SICL COST	(5.5% of 1A) =	\$1,647			
C. DESIGN COST	(6.0% of 1A) =	\$1,797			
D. TOTAL COST	(1A + 1B + 1C) =	\$33,387			
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0			
F. PUBLIC UTILITY COMPANY REBATE =		\$0			
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$33,387			
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	287	\$3,477	15.88	\$55,214
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(279)	(\$1,151)	18.30	(\$21,054)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$381	14.88	\$5,663
F. TOTAL		8	\$2,707	----->	\$39,823
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+)	YEAR OF COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
				(TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$21,050		5	0.863	\$18,166
b.					\$0
c.					\$0
d.					\$0
e.					\$0
f. TOTAL	\$21,050				\$18,166
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =			\$18,166
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)			(2F3 + 3A4 + (3Bf1/Economic Life))		\$3,759
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)		(1G/4) =			8.88
6. TOTAL NET DISCOUNTED SAVINGS		(2F5 + 3C) =			\$57,988
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)		(6/1G) =			1.74

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.

Denver, CO

SHEET 1 OF 1				DATE PREPARED 22-May-95				
ESTIMATOR C. Wohleit				CHECKED BY A. Niemeyer				
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST		TOTAL
1	2	BUILDING 7606	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
3	4	PROPOSED SYSTEM MODIFICATIONS						
4	AHU8000	NEW SYSTEMS INSTALLATION 8,000 CFM AHU COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6 1-ELEC 1-ELEC Q-1	\$1,608 \$33 \$23 \$233 \$10,475
5	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	0.8 0.727 0.2	\$33 \$23 \$233 \$82
6	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11		\$34
7	STLPIP15	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	60.0	\$2.95	\$177		\$409
8		FITTINGS ADD 5%				\$9		\$20
9	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40	\$84	Q-14 1-PLUM 1-ELEC	\$12 \$88 \$20 \$402
10	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	0.08 0.471 21	\$172 \$20 \$879 \$5,769
11	VSD5	VARIABLE SPEED DRIVE W/ CONTRLER, 5HP	EA.	2.0	\$2,444.79	\$4,890		
12	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	0.098 0.046	\$711 \$254 \$399
13	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145		
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25		EXISTING SYSTEMS DEMOLITION						
26		AHU DEMO						
27								
28								
29								
30								
31		SUBTOTAL				\$14,751		\$4,670 \$785 \$545 \$1,200 \$7,200
32		OVERHEAD				\$2,478		\$19,421 \$3,263 \$2,268 \$4,991 \$29,943
33		PROFIT				\$1,723		
34		CONTINGENCY				\$3,791		
35		TOTAL COST				\$22,743		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1				DATE PREPARED 22-May-95		ESTIMATOR C. Wohlert		CHECKED BY A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST			
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7606							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5	6								
6	7								
7	8								
8	9								
9	10								
10	11								
11	12								
12	13								
13	14								
14	15	TOTAL ANNUAL MAINTENANCE COST - BASELINE				\$0	-	-	\$0
15	16	ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
16	17								
17	18								
18	19								
19	20								
20	21								
21	22								
22	23								
23	24								
24	25								
25	26								
26	27								
27	28								
28	29	TOTAL ANNUAL MAINTENANCE COST - BASELINE				\$0	-	-	\$0
29	30	TOTAL ANNUAL MAINTENANCE COST SAVINGS							
30	31								
31	32								
32	33								
33	34								
34	35	TOTAL ANNUAL MAINTENANCE COST SAVINGS				\$0	-	-	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver CO

ENGINEER'S OPINION OF PROBABLE COST				SHEET	1	OF	1
PROJECT	Fort Riley Feasibility Study for HVAC Upgrade			DATE PREPARED	22-May-95		
ENGINEER	E M C Engineers, Inc. Denver, CO			ESTIMATOR	C. Wohiert		
CHECKED BY	A. Niemeyer			LABOR COST			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	Crew/ Worker	Hours/ Unit	TOTAL
1	2	BUILDING 7606 NON-RECURRING					
3	4	EXISTING SYSTEM REPLACEMENT					
5	AHU8000	8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	Q-6	\$1,608
6	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	Q-10	\$571
7	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	0.8	\$33
8	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	1-ELEC	\$82
9	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	60.0	\$2.95	Q-1	\$23
10	INSLPIP1.5	FITTINGS ADD 5%			\$177	0.2	\$409
11	CNTV1	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40	Q-14	\$12
12	DTINSL1"	CONTROL VALVE 1"	EA.	2.0	\$190.89	1-PLUM	\$88
13		DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	Q-14	\$20
14							\$402
15							\$399
16							
17							
18							
19							
20							
21		EXISTING SYSTEMS DEMOLITION					
22		AHU DEMO	TON	2.8			
23							
24							
25							
26							
27							
28							
29							
30							
31	OH	SUBTOTAL					\$3,791
32	PRO	OVERHEAD					\$637
33	CONT	PROFIT					\$443
34		CONTINGENCY					\$974
35		TOTAL COST					\$5,845

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7606 - Replace Kitchen MAUs & Exhaust w/ Heat Recovery Units

A. CONSTRUCTION COST	=	\$81,017
B. SIC09 COST	(5.5% of 1A) =	\$4,456
C. DESIGN COST	(6.0% of 1A) =	\$4,861
D. TOTAL COST	(1A + 1B + 1C) =	\$90,334
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$90,334

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	103	\$1,250	15.88	\$19,853
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,511	\$14,465	18.30	\$264,706
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$332	14.88	\$4,942
F. TOTAL		3,614	\$16,047	----->	\$289,501

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)				
1 ANNUAL MAINTENANCE		\$0	14.88	\$0
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)		\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$30,377	5	0.863	\$26,215
b.				\$0
c.				\$0
d. TOTAL	\$30,377			\$26,215

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bd4) = \$26,215

- 4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bd1/Economic Life)) \$17,566
- 5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 5.14
- 6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$315,716
- 7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 3.49
(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						DATE PREPARED	22-May-95
ESTIMATOR						C. Wohlert	
CHECKED BY						A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST	TOTAL
1	2	BUILDING 7606 PROPOSED SYSTEM MODIFICATIONS					
3	KHRU9C	NEW SYSTEMS INSTALLATION	EA.	1.0	\$28,294.80	\$28,295	\$804
4	KHRU5	KITCHEN HEAT RECOVERY UNIT, 19,000 CFM	EA.	1.0	\$17,442.00	\$17,442	\$643
5	DUCT1000	KITCHEN HEAT RECOVERY UNIT, 8,500 CFM	LB.	950.0	\$0.47	\$442	\$1,735
6	STLPIP2	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	L.F.	50.0	\$3.91	\$196	\$242
7	INSLPIP2	STEEL PIPE SCH. 40, 2" WHANGERS	L.F.	50.0	\$1.46	\$73	\$12
8	DTINSL2"	FITTINGS, 5%	S.F.	700.0	\$0.83	\$583	\$683
9		2" FIBERGLASS PIPE INSULATION, 1.5" THICK					
10		DUCT INSULATION, 2" THICK					
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23		EXISTING SYSTEM DEMOLITION					
24		AHU DEMOLITION	TON	3.6		17.778	\$1,241
25		DUCT DEMOLITION	TON	0.2		17.778	\$69
26							
27							
28							
29							
30		SUBTOTAL					
31		OVERHEAD					
32		PROFIT					
33		CONTINGENCY					
34		TOTAL COST					
35							

\$5,508
\$925
\$643
\$1,415
\$8,491

\$52,548
\$8,828
\$6,138
\$13,503
\$81,017

\$29,099
\$18,085
\$2,177
\$438
\$22

\$20,999
\$18,085
\$2,177
\$438
\$22

\$20,999
\$18,085
\$2,177
\$438
\$22

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1				DATE PREPARED 22-May-95		ESTIMATOR C. Wohlert		CHECKED BY A. Niemeyer	
Line No.	Item Refer Code	Item Description		MATERIAL COST		LABOR COST		Total	TOTAL
		Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit		
1		BUILDING 7606							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE			\$0	-	-	\$0	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE			\$0	-	-	\$0	\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS							

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 7606				NON-RECURRING				NEW SYSTEMS INSTALLATION				LABOR COST				SHEET 1 OF 1	
Line No.	Item Refer Code	Item Description		Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	TOTAL						
1																	
2																	
3																	
4	AHU12000	12,000 CFM AHU, HEATING ONLY	EA.	1.0	\$5,499.08	\$5,499	Q-6	52.174		\$1,049							
5	AHU3200	3,200 CFM AHU, HEATING ONLY	EA.	1.0	\$2,519.40	\$2,519	Q-5	20		\$388							
6	AHU1300	1,300 CFM AHU, HEATING ONLY	EA.	1.0	\$1,913.78	\$1,914	Q-5	13.33		\$258							
7	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" WHANGERS FITTINGS, 5%	L.F.	90.0	\$2.95	\$265	Q-1	0.2		\$349							
8																	
9	CNTV1.5	CONTROL VALVE 1-1/2"	EA.	3.0	\$276.17	\$828	1-PLUM	0.727		\$47							
10	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	90.0	\$1.40	\$126	Q-14	0.08		\$133							
11	DUCT1000	GAL. STEEL DUCTWORK, 50 TO 1000 LB.	LB.	450.0	\$0.47	\$209	Q-10	0.094		\$822							
12	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053		\$683							
13	EXHOD1.3	ROOF EXHAUSTER, 1,300 CFM	EA.	1.0	\$479.66	\$480	Q-20	4		\$77							
14	EXHOD11	ROOF EXHAUSTER, 11,000 CFM	EA.	1.0	\$1,986.45	\$1,986	Q-20	10		\$192							
15	EXHOD3.6	ROOF EXHAUSTER, 3,600 CFM	EA.	1.0	\$823.65	\$824	Q-20	5		\$96							
16																	
17																	
18																	
19																	
20																	
21		EXISTING SYSTEM DEMOLITION AHU DEMOLITION	TON	1.0													
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31	OH	SUBTOTAL															
32	PRO	OVERHEAD															
33	CONT	PROFIT															
34		CONTINGENCY															
35		TOTAL COST															

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7606 - Replace Large STM Boiler w/ Smaller STM & HW Boilers					
A. CONSTRUCTION COST	=			\$80,100	
B. SIOH COST	(5.5% of 1A) =			\$4,406	
C. DESIGN COST	(6.0% of 1A) =			\$4,806	
D. TOTAL COST	(1A + 1B + 1C) =			\$89,312	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =				\$0	
F. PUBLIC UTILITY COMPANY REBATE =				\$0	
G. TOTAL INVESTMENT	(1D - 1E - 1F) =			----->	\$89,312
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	(111)	(\$1,338)	15.88	(\$21,247)
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	1,528	\$6,295	18.30	\$115,205
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		1,417	\$4,957	----->	\$93,958
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			(\$181)	14.88	(\$2,693)
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			(\$181)		(\$2,693)
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
(TABLE A-2)					
a. BASELINE EQUIP. REPLACEMENT	\$101,942	5	0.863	\$87,976	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$101,942			\$87,976	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =			\$85,284
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
		(2F3 + 3A4 + (3Bf1/Economic Life))			\$9,874
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)		(1G/4) =			9.05
6. TOTAL NET DISCOUNTED SAVINGS		(2F5 + 3C) =			\$179,241
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)		(6/1G) =			2.01

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

ENGINEER'S OPINION OF PROBABLE COST							SHEET 1	OF 1
PROJECT	Fort Riley Feasibility Study for HVAC Upgrade						DATE PREPARED 22-May-95	
ENGINEER	E M C Engineers, Inc.						ESTIMATOR C. Wohlett	
	CHECKED BY A. Niemeyer							
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	Unit Cost	MATERIAL COST	LABOR COST	TOTAL
		BUILDING 7606 PROPOSED SYSTEM MODIFICATIONS						
1	2	NEW SYSTEMS INSTALLATION						
3	4	BOILER, STEAM, 2 MBH, 85%	EA.	1.0	\$15,640	\$15,640	Q-7	\$731
5	5	BOILER, HOT WATER, 2 MBH, 85%	EA.	1.0	\$16,110	\$16,110	Q-7	\$658
6	6	STEEL PIPE SCH. 40, 2" W/HANGERS	L.F.	90.0	\$3.91	\$352	Q-1	\$436
7	7	VALVES & FITTINGS, 25%				\$88		\$109
8	8	2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	90.0	\$1.46	\$132	Q-14	0.084
9	9	STEEL PIPE SCH. 40, 6" W/HANGERS	L.F.	25.0	\$17.93	\$448	Q-16	0.667
10	10	FITTINGS, 10%				\$45		\$362
11	11	6" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	25.0	\$2.18	\$55	Q-14	0.145
12	12	PUMP, 5 HP	EA	1.0	\$1,114.35	\$1,114	Q-1	\$67
13	13	PMP5HP						\$121
14	14							\$1,287
15	15							
16	16							
17	17							
18	18							
19	19							
20	20							
21	21	EXISTING SYSTEMS DEMOLITION						
22	22	BOILER DEMOLITION	EA.	1.0			Q-6	
23	23	ASBESTOS REMOVAL (HRU)	GLV. BAG	38.0	\$170.00	\$6,460		\$5,529
24	24	ASBESTOS REMOVAL (BOILER)	FLUE	1.0	\$3,270.00	\$3,270		\$6,460
25	25							\$3,270
26	26							
27	27							
28	28							
29	29							
30	30							
31	31	SUBTOTAL						
32	32	OVERHEAD						
33	33	PROFIT						
34	34	CONTINGENCY						
35	35	TOTAL COST						

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

			SHEET 1 OF 1		
			DATE PREPARED 22-May-95		
			ESTIMATOR C. Wohler		
			CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
1	2	BUILDING 7606 ANNUAL RECURRING	Quantity	Unit Cost	Hours/ Unit
3	4	ANNUAL MAINTENANCE COST - BASELINE MAINT. ON BOILERS - >2.5 MBH	EA.	Total	Total
5	6		1.0	\$96.90	\$97
7	8				Q-6
9	10				25
11	12				\$503
13	14				\$600
15	16	TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	\$97	\$503
17	18	ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT MAINT. ON BOILERS - <2.5 MBH	EA.	2.0	\$48.45
19	20				\$97
21	22				Q-6
23	24				17
25	26				\$684
27	28				\$780
29	30	TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	\$97	\$684
31	32				\$780
33	34				(\$181)
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	\$0	

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						
			DATE PREPARED		22-May-95	
			ESTIMATOR		C. Wohlert	
			CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	TOTAL
				Quantity	Unit Cost	Total
					Crew/ Worker	Hours/ Unit
1	2	BUILDING 7606 NON-RECURRING				
3	4	BASELINE - EXISTING EQUIP. REPLACEMENT				
5	6	CAST IRON STEAM BOILER, 6.97 MBH STEEL PIPE SCH. 40, 6" W/HANGERS	EA.	1.0	\$51,357	\$59,579
6	7	FITTINGS, 10%	L.F.	25.0	\$17.93	\$810
7	8	6" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	25.0	\$2.18	\$81
8	9				\$45	\$121
9	10				\$55	
10	11				Q-14	\$67
11	12				0.145	
12	13				400	\$8,222
13	14				0.667	\$362
14	15					
15	16					
16	17					
17	18					
18	19					
19	20					
20	21	EXISTING SYSTEMS DEMOLITION				
21	22	BOILER DEMOLITION				
22	23					
23	24					
24	25					
25	26					
26	27					
27	28					
28	29					
29	30					
30	31	SUBTOTAL				
31	32	OVERHEAD				
32	33	PROFIT				
33	34	CONTINGENCY				
34	35	TOTAL COST				
35						

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7654 - Replace SZs AHUs In Dining area w/ VAV AHUs					
A. CONSTRUCTION COST	=		\$29,943		
B. SIOH COST	(5.5% of 1A) =		\$1,647		
C. DESIGN COST	(6.0% of 1A) =		\$1,797		
D. TOTAL COST	(1A + 1B + 1C) =		\$33,387		
E. SALVAGE VALUE OF EXISTING EQUIPMENT =			\$0		
F. PUBLIC UTILITY COMPANY REBATE =			\$0		
G. TOTAL INVESTMENT	(1D -1E -1F) =		----->	\$33,387	
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	287	\$3,477	15.88	\$55,214
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(279)	(\$1,151)	18.30	(\$21,054)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$381	14.88	\$5,663
F. TOTAL		8	\$2,707	----->	\$39,823
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
			(TABLE A-2)		
a. BASELINE EQUIP. REPLCMNT.	\$21,050	5	0.863	\$18,166	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$21,050			\$18,166	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =			\$18,166	
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bf1/Economic Life))	\$3,759	
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)					
			(1G/4) =	8.88	
6. TOTAL NET DISCOUNTED SAVINGS					
			(2F5 + 3C) =	\$57,988	
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)					
			(6/1G) =	1.74	

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 7654			PROPOSED SYSTEM MODIFICATIONS			MATERIAL COST			LABOR COST			SHEET 1 OF 1	DATE PREPARED 22-May-95	ESTIMATOR C. Wohlert	CHECKED BY A. Niemeyer
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	Total					
1															
2															
3															
4	AHU8000	NEW SYSTEMS INSTALLATION 8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608	\$10,475					
5	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82					
6	WIRE#12	COPPER WIRING #12	EA.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23	\$34					
7	STLPIP15	STEEL PIPE SCH. 40, 1.5" W/HANGERS	C.L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233	\$409					
8		FITTINGS ADD 5%	L.F.			\$9									
9	INSLPIP15	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	EA.	60.0	\$1.40	\$84	Q-14	0.08	\$88	\$172					
10	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402					
11	VSD5	VARIABLE SPEED DRIVE W/ CONTRLER, 5HP	EA.	2.0	\$2,444.79	\$4,890	1-ELEC	21	\$879	\$5,769					
12	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$71	\$711					
13	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254	\$399					
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
31															
32	OH PRO	SUBTOTAL OVERHEAD PROFIT CONTINGENCY	TON	2.8											
33															
34															
35															

\$4,670
\$785
\$545
\$1,200
\$7,200

\$19,421
\$3,263
\$2,268
\$4,991
\$29,943

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1				SHEET 1 OF 1	SHEET 1 OF 1
DATE PREPARED 22-May-95			ESTIMATOR C. Wohlert		
CHECKED BY A. Niemeyer					
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
1		BUILDING 7654	Unit Cost	Total	Crew/ Worker
2		ANNUAL RECURRING	Quantity		Hours/ Unit
3		ANNUAL MAINTENANCE COST - BASELINE			Total
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT			
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0	\$0
30					
31					
32					
33					
34					
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS		\$0	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

			SHEET 1 OF 1			DATE PREPARED 22-May-95			
			ESTIMATOR C. Wohlert			CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	Crew/ Worker	Hours/ Unit	LABOR COST	TOTAL
1	2	BUILDING 7654							
3	4	NON-RECURRING							
4	AHU8000	EXISTING SYSTEM REPLACEMENT	EA.	2.0	\$4,433.18	Q-6	40	\$1,608	\$10,475
5	DUCT500	8,000 CFM AHU, COOLING ONLY	LB.	300.0	\$0.47	Q-10	0.098	\$571	\$711
6	E-TSTAT1	GAL. STEEL DUCTWORK, 200 TO 500 LB.	EA.	2.0	\$24.23	1-ELEC	0.8	\$33	\$82
7	WIRE#12	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	C.L.F.	1.5	\$7.41	1-ELEC	0.727	\$23	\$34
8	STLPIP1.5	COPPER WIRING #12	L.F.	60.0	\$2.95	Q-1	0.2	\$233	\$409
9	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" WHANGERS	L.F.	60.0	\$177				
10	INSLPIP1.5	FITTINGS ADD 5%	EA.	2.0	\$9				
11	CNTV1	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	S.F.	300.0	\$1.40	Q-14	0.08	\$12	\$20
12	DTINSL1"	CONTROL VALVE 1"			\$190.89	1-PLUM	0.471	\$88	\$172
13		DUCT INSULATION, 1" THICK			\$0.48	Q-14	0.046	\$20	\$402
14					\$145			\$254	\$399
15									
16									
17									
18									
19									
20									
21									
22		EXISTING SYSTEMS DEMOLITION							
23		AHU DEMO	TON	2.8					
24									
25									
26									
27									
28									
29									
30									
31		SUBTOTAL			\$9,862			\$3,791	\$13,653
32		OVERHEAD			\$1,657			\$637	\$2,294
33		PROFIT			\$1,152			\$443	\$1,595
34		CONTINGENCY			\$2,534			\$974	\$3,508
35		TOTAL COST			\$15,205			\$5,845	\$21,050

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7654 - Replace Kitchen MAUs & Exhaust w/ Heat Recovery Units

A. CONSTRUCTION COST	=	\$81,017
B. SIC0H COST	(5.5% of 1A) =	\$4,456
C. DESIGN COST	(6.0% of 1A) =	\$4,861
D. TOTAL COST	(1A + 1B + 1C) =	\$90,334
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$90,334

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	103	\$1,250	15.88	\$19,853
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,511	\$14,465	18.30	\$264,706
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$332	14.88	\$4,942
F. TOTAL		3,614	\$16,047	----->	\$289,501

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)				
1 ANNUAL MAINTENANCE		\$0	14.88	\$0
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)		\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
(TABLE A-2)				
a. BASELINE EQUIP. REPLCMNT.	\$30,377	5	0.863	\$26,215
b.				\$0
c.				\$0
d. TOTAL	\$30,377			\$26,215
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bd4) =			\$26,215

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bd1/Economic Life))	\$17,566
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	5.14
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$315,716
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)	(6/1G) =	3.49

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER EMC Engineers, Inc.
Denver, CO

						SHEET 1	OF 1
			DATE PREPARED 22-May-95			ESTIMATOR C. Wohlert	CHEKED BY A. Niemeyer
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST	
1	2	BUILDING 7654					
3	4	PROPOSED SYSTEM MODIFICATIONS					
4	KHRU9C	NEW SYSTEMS INSTALLATION	EA.	1.0	\$28,294.80	\$28,295	
5	KHRU5	KITCHEN HEAT RECOVERY UNIT, 19,000 CFM	EA.	1.0	\$17,442.00	\$17,442	
6	DUCT1000	KITCHEN HEAT RECOVERY UNIT, 8,500 CFM	LB.	950.0	\$0.47	\$442	
7	STLPIP2	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	L.F.	50.0	\$3.91	\$196	
8		STEEL PIPE SCH. 40, 2" W/HANGERS				Q-1	
9		FITTINGS, 5%				0.25	
10	INSLPIP2	2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	50.0	\$1.46	\$73	
11	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	
12						Q-14	
13						0.053	
14						\$683	
15							
16							
17							
18							
19							
20							
21							
22							
23		EXISTING SYSTEM DEMOLITION					
24		AHU DEMOLITION	TON	3.6		Q-5	
25		DUCT DEMOLITION	TON	0.2		Q-5	
26						17.778	
27							
28							
29							
30							
31	OH	SUBTOTAL					
32	PRO	OVERHEAD					
33	CONT	PROFIT					
34		CONTINGENCY					
35		TOTAL COST					

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

				SHEET 1 OF 1
				DATE PREPARED 22-May-95
				ESTIMATOR C. Wohlert
				CHECKED BY A. Niemeyer
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST
1		BUILDING 7654	Unit	Unit Cost
2		ANNUAL RECURRING	Quantity	Total
3		ANNUAL MAINTENANCE COST - BASELINE		
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT		\$0
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0
30				
31				
32				
33				
34				
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS		\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.
Denver, CO

DATE PREPARED 22-May-95

ESTIMATOR C. Wohlert

CHECKED BY A. Niemeyer

								SHEET 1 OF 1
Line No.	Item Refer Code	Item Description		Unit of Measure	Quantity	MATERIAL COST	LABOR COST	
1	2	BUILDING 7654	NON-RECURRING					
3	3	NEW SYSTEMS INSTALLATION						
4	4	AHU12000	12,000 CFM AHU, HEATING ONLY	EA.	1.0	\$5,499.08		
5	5	AHU3200	3,200 CFM AHU, HEATING ONLY	EA.	1.0	\$2,519.40		
6	6	AHU1300	1,300 CFM AHU, HEATING ONLY	EA.	1.0	\$1,913.78		
7	7	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" WI/HANGERS FITTINGS, 5%	L.F.	90.0	\$2.95		
8	8	CNTV1.5	CONTROL VALVE 1-1/2"	EA.	3.0	\$276.17	\$828	1-PLUM
9	9	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	90.0	\$1.40	\$126	Q-14
10	10	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	450.0	\$0.47	\$209	Q-10
11	11	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$563	Q-14
12	12	EXHOD13	ROOF EXHAUSTER, 1,300 CFM	EA.	1.0	\$479.66	\$480	Q-20
13	13	EXHOD11	ROOF EXHAUSTER, 11,000 CFM	EA.	1.0	\$1,986.45	\$1,986	Q-20
14	14	EXHOD36	ROOF EXHAUSTER, 3,600 CFM	EA.	1.0	\$823.65	\$824	Q-20
15	15							
16	16							
17	17							
18	18							
19	19							
20	20							
21	21							
22	22		EXISTING SYSTEM DEMOLITION					
23	23		AHU DEMOLITION					
24	24							
25	25							
26	26							
27	27							
28	28							
29	29							
30	30							
31	31		SUBTOTAL			\$15,247		
32	32		OVERHEAD			\$2,562		
33	33		PROFIT			\$1,781		
34	34		CONTINGENCY			\$3,918		
35	35		TOTAL COST			\$23,507		

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

\$6,548
\$2,907
\$2,172
\$614
\$31
\$875
\$258
\$1,031
\$1,267
\$556
\$2,178
\$920
\$345

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

\$1,049
\$388
\$258
\$349
\$117
\$47
\$133
\$822
\$683
\$77
\$192
\$96
\$345

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

\$6,548
\$2,907
\$2,172
\$614
\$31
\$875
\$258
\$1,031
\$1,267
\$556
\$2,178
\$920
\$345

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT:	BLDG 7654 - Replace Large STM Boiler w/ Smaller STM & HW Boilers			
A. CONSTRUCTION COST	=		\$80,100	
B. SIOH COST	(5.5% of 1A) =		\$4,406	
C. DESIGN COST	(6.0% of 1A) =		\$4,806	
D. TOTAL COST	(1A + 1B + 1C) =		\$89,312	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =			\$0	
F. PUBLIC UTILITY COMPANY REBATE =			\$0	
G. TOTAL INVESTMENT	(1D - 1E - 1F) =			-----> \$89,312

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	(111)	(\$1,338)	15.88	(\$21,247)
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	1,528	\$6,295	18.30	\$115,205
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		1,417	\$4,957		-----> \$93,958

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE		(\$181)		14.88	(\$2,693)
2		\$0		14.88	\$0
3		\$0		14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST		(\$181)			(\$2,693)
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLACEMENT	\$101,942	5	0.863	\$87,976	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$101,942			\$87,976	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =			\$85,284
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)			(2F3 + 3A4 + (3Bf1/Economic Life))		\$9,874
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)		(1G/4) =			9.05
6. TOTAL NET DISCOUNTED SAVINGS		(2F5 + 3C) =			\$179,241
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)		(6/1G) =			2.01

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1				DATE PREPARED 22-May-95	
				ESTIMATOR	C. Wohlert
				CHECKED BY	A. Niemeyer
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
			Quantity	Unit Cost	Total
1	2	BUILDING 7654 PROPOSED SYSTEM MODIFICATIONS			
3	4	NEW SYSTEMS INSTALLATION			
5	6	BOILER, STEAM, 2 MBH, 85%	EA.	1.0 \$15,640	Q-7 35.556 \$731
7	STLPIP2	BOILER, HOT WATER, 2 MBH, 85%	EA.	1.0 \$16,110	Q-7 32 \$658
8	INSLPIP2	STEEL PIPE SCH. 40, 2" WHANGERS	L.F.	90.0 \$3.91	Q-1 0.25 \$436
9	STLPIP6	VALVES & FITTINGS, 25%			\$88 \$109
10	INSLPIP6	2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	90.0 \$1.46	Q-14 0.084 \$139
11	PMP5HP	STEEL PIPE SCH. 40, 6" WHANGERS	L.F.	25.0 \$17.93	Q-16 0.667 \$362
12	INSLPIP6	FITTINGS, 10%			\$48 \$36
13	PMP5HP	6" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	25.0 \$2.18	Q-14 0.145 \$67
14		PUMP, 5 HP	EA	1.0 \$1,114.35	Q-1 8.889 \$172
15					
16					
17					
18					
19					
20					
21		EXISTING SYSTEMS DEMOLITION			
22		BOILER DEMOLITION			
23		ASBESTOS REMOVAL (HRU)	EA.	1.0 \$6,460	Q-6 275 \$5,529
24		ASBESTOS REMOVAL (BOILER)	GLV. BAG	38.0 \$3,270	
25			FLUE	1.0	
26					
27					
28					
29					
30					
31	OH	SUBTOTAL		\$43,714	\$8,240
32	PRO	OVERHEAD		\$7,344	\$1,384
33	CONT	PROFIT		\$5,106	\$962
34	TOTAL COST	CONTINGENCY		\$11,233	\$2,117
35				\$67,396	\$12,704

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

ENGINEER'S OPINION OF PROBABLE COST

PROJECT East Bay Feasibility Study for HVAC Upgrade

THEORY | causality | first principles

EMC Engineers, Inc.

ENGINEER'S OPINION OF PROBABLE COST							SHEET 1	OF 1
PROJECT Fort Riley Feasibility Study for HVAC Upgrade				DATE PREPARED 22-May-95				
ENGINEER EMC Engineers, Inc.				ESTIMATOR C. Wohlett				
CHECKED BY A. Niemeyer								
Line No.	Item Refer Code	Item Description		Unit of Measure	MATERIAL COST		LABOR COST	
		Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	Total
1	2	BUILDING 7654 NON-RECURRING						
3	4	BASELINE - EXISTING EQUIP. REPLACEMENT						
5	6.97	CAST IRON STEAM BOILER, 6.97 MBH						
6	STLPIP6	STEEL PIPE SCH. 40, 6" W/HANGERS						
7	FITTINGS, 10%							
8	INSLPIP6	6" FIBERGLASS PIPE INSULATION, 1.5" THCK						
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21		EXISTING SYSTEMS DEMOLITION						
22		BOILER DEMOLITION						
23								
24								
25								
26								
27								
28								
29								
30								
31	OH	SUBTOTAL						
32	PRO	OVERHEAD						
33	CONT	PROFIT						
34	TOTAL COST	CONTINGENCY						
35								

FEMP Project No. 3

Upgrade HVAC Systems in Indoor Swimming Pools
Buildings 6940 and 8069

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		4. PROJECT TITLE Upgrade HVAC Systems in Indoor Swimming Pool Buildings		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Upgrade HVAC Systems in Indoor Swimming Pool Buildings	LS			335
TOTAL CONTRACT COST				<u>335</u>
SIOH (5.5%)				18
DESIGN COST (6.0%)				<u>20</u>
TOTAL PROJECT COST				373
Total Request (Rounded)				375
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the indoor swimming pools, Buildings 6940 and 8069. The HVAC system upgrades include the following:				
<ul style="list-style-type: none"> Replace the existing heating and ventilating unit (H&V) serving the swimming pool area of Building 6940 with a heat recovery air handling unit (HRU). Exhaust ductwork will be installed to exhaust the air out through the roof. A roof outlet will be installed for the exhaust air. The existing outside air ductwork will remain. Replace four existing H&Vs serving the swimming pool area of Building 8069 with two HRUs. Exhaust ductwork will be installed to exhaust the air out through the roof. A roof outlet will be installed for the exhaust air. The existing outside air ductwork will remain. 				
11. REQUIREMENT:				
<p>Project: This Federal Energy Management Program (FEMP) project will replace the existing H&Vs with HRUs in the indoor swimming pools, Buildings 6940 and 8069.</p> <p>Requirement: This project is required to reduce the natural gas and electrical consumption by replacement of the existing H&Vs with HRUs. An immediate utility savings would be recognized.</p> <p>Current Situation: The indoor swimming pool, Building 6940, is a 23,450 sq ft single story building with the pool area heated and ventilated by a H&V. The indoor swimming pool and gymnasium, Building 8069, is a 25,620 sq ft two story building with the pool area heated and ventilated by four H&Vs.</p>				

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA		2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			
4. PROJECT TITLE Upgrade HVAC Systems in Indoor Swimming Pool Buildings		5. PROJECT NUMBER	

11. REQUIREMENT (continued):

Impact if Not Provided: If this project is not funded, a reduction of 11,951 MBtu/yr (12,596,354 MJ/yr) cannot be achieved. The Army will not realize a \$57,226 annual energy dollar savings with a 6.32 year simple payback and a savings-to-investment ratio (SIR) of 2.81. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.

Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.

Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.

Amount of Energy Conserved: The amount of energy conserved is estimated to be 11,951 MBtu per year (12,596,354 MJ/yr).

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Upgrade HVAC Systems in Indoor Swimming Pools		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/24/95	ECONOMIC LIFE:	20	PREPARED BY:	A. Niemeyer

1. INVESTMENT: Indoor Swimming Pools in Buildings 6940 and 8069 - Replace existing H&Vs with HRUs

A. CONSTRUCTION COST	=	\$334,555
B. SIOH COST	(5.5% of 1A) =	\$18,401
C. DESIGN COST	(6.0% of 1A) =	\$20,073
D. TOTAL COST	(1A + 1B + 1C) =	\$373,029
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$373,029

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	1,001	\$12,112	15.88	\$192,340
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	10,950	\$45,114	18.30	\$825,586
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$0	14.88	\$0
F. TOTAL		11,951	\$57,226	----->	\$1,017,926

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-):

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-):

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED AVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$35,706	5	0.863	\$30,814
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$35,706			\$30,814

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$30,814

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$59,011

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 6.32

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$1,048,741

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.81
(MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 3

Upgrade HVAC Systems in Indoor Swimming Pools
Buildings 6940 and 8069

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 6940 - Replace H&V Unit with Pool Heat Recovery Unit

A. CONSTRUCTION COST	=	\$178,678
B. SIOH COST	(5.5% of 1A) =	\$9,827
C. DESIGN COST	(6.0% of 1A) =	\$10,721
D. TOTAL COST	(1A + 1B + 1C) =	\$199,226
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$199,226

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	706	\$8,545	15.88	\$135,695
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	7,727	\$31,836	18.30	\$582,608
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		8,434	\$40,381	----->	\$718,302

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
(TABLE A-2)					
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$0			\$0	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =				\$0
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bf1/Economic Life))				\$40,381
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =				4.93
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =				\$718,302
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)	(6/1G) =				3.61

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 6940							SHEET 1 OF 1
			DATE PREPARED 22-May-95				
			ESTIMATOR C. Wohlert				
			CHECKED BY A. Niemeyer				
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST	
				Unit Cost	Total	Crew/ Worker	Hours/ Unit
1	2	PROPOSED SYSTEM MODIFICATIONS					
3	4	NEW SYSTEMS INSTALLATION					
5	6	Z-PACK Heat Recovery Unit, 24,800 CFM STEEL PIPE SCH. 40, 3" W/HANGERS FITTINGS, 5%	EA. L.F.	1.0 45.0	\$100,600 \$6.40	\$100,600 \$288	Q-6 Q-15 0.372
7	8	CONTROL VALVE 2-1/2" 3" FIBERGLASS PIPE INSULATION, 1.5" THICK GAL. STEEL DUCTWORK, 2000 TO 5000 LB.	EA. L.F. LB.	1.0 45.0 2600	\$935.09 \$1.66 \$0.45	\$935 \$75 \$1,159	1-PLUM Q-14 Q-10 0.094 3.556
9	10	INSLPIP3 DUCT5000 ROFEXH25	EA. EA.	1.0 1.0	\$3,972.90	\$3,973	Q-9 17.778
11	12	ALUMINUM GALV. ROOF INTAKE, 25,000 CFM ROOF PENETRATION	EA.	1.0	\$24.23	\$24	Q-5 32 0.087
13	14	E-TSTAT1 WIRE#12	EA. C.L.F.	1.0 1.0	\$7.41	\$7	1-ELEC 1-ELEC 0.8 0.727
15	16	COPPER WIRING #12					
17	18						
19	20						
21	22						
23	24						
25	26						
27	28	EXISTING SYSTEMS DEMOLITION					
29	30	AHU DEMO DUCT DEMO	TON TON	2.0 0.7	\$107,075	Q-5 Q-5 17.778 17.778	\$689 \$241
31	32	SUBTOTAL					
33	34	OVERHEAD PROFIT CONTINGENCY				17% 10% 20%	\$8,817 \$1,481 \$1,030 \$2,266 \$13,594
35		TOTAL COST					\$115,892 \$19,470 \$13,536 \$29,780 \$178,678

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 8069 - Replace H&V Units with Pool Heat Recovery Units

A. CONSTRUCTION COST	=	\$155,877
B. SIOH COST	(5.5% of 1A) =	\$8,573
C. DESIGN COST	(6.0% of 1A) =	\$9,353
D. TOTAL COST	(1A + 1B + 1C) =	\$173,802
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$173,802

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	295	\$3,563	15.88	\$56,588
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,223	\$13,277	18.30	\$242,964
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		3,517	\$16,840	----->	\$299,551

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-):

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-):

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$35,706	5	0.863	\$30,814
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$35,706			\$30,814

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$30,814

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$18,625

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 9.33

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$330,365

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 1.90
(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 8069							SHEET 1 OF 1			
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	TOTAL
1	2	PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		Z-PACK Heat Recovery Unit, 9,000 CFM	EA.	2.0	\$43,650	\$87,300	Q-6	63.37	\$2,548	\$89,848
5	STLPIP3	STEEL PIPE SCH. 40, 3" W/HANGERS	L.F.	200.0	\$6.40	\$1,279	Q-15	0.372	\$1,443	\$2,722
6		FITTINGS, 5%								
7	INSLPIP3	3" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	200.0	\$1.66	\$331	Q-14	0.094	\$72	\$136
8	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	1260.0	\$0.47	\$586	Q-10	0.094	\$346	\$678
9	ROFEXH15	ALUMINUM GALV. ROOF INTAKE, 15,000 CFM	EA.	1.0	\$2,616.30	\$2,616	Q-9	12.3	\$2,301	\$2,887
10	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8	\$231	\$2,847
11	WIRE#12	COPPER WIRING #12	C.L.F.	1.0	\$7.41	\$7	1-ELEC	0.727	\$17	\$41
12		ROOF PENETRATION	EA.	2.0			Q-5	14	\$15	\$23
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27		EXISTING SYSTEMS DEMOLITION								
28		AHU DEMO	TON	4.0			Q-5	17.778	\$1,379	\$1,379
29										
30		SUBTOTAL								
31	OH	OVERHEAD								
32	PRO	PROFIT								
33	CONT	CONTINGENCY								
34										
35		TOTAL COST								

DATE PREPARED 22-May-95
 ESTIMATOR C. Wohlert
 CHECKED BY A. Niemeyer

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.

Denver, CO

			SHEET 1 OF 1		
			DATE PREPARED 22-May-95		
			ESTIMATOR C. Wohlert		
			CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
				Unit Cost Quantity	Crew/ Worker Hours/ Unit
				Total	Total
1		BUILDING 8069			
2		ANNUAL RECURRING			
3		ANNUAL MAINTENANCE COST - BASELINE			
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT			
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0	\$0
30					
31					
32					
33					
34					
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS		\$0	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver CO

FEMP Project No. 4

Upgrade HVAC Systems in Bowling Alley and Community
Activities Center

Bowling Alley - Building 7485
Community Activities Center - Building 6620

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		4. PROJECT TITLE Upgrade HVAC Systems in Bowling Alley and Community Activities Center		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Upgrade HVAC Systems in Bowling Alley and Community Activities Center	LS			67
TOTAL CONTRACT COST				<u>67</u>
SIOH (5.5%)				4
DESIGN COST (6.0%)				<u>4</u>
TOTAL PROJECT COST				75
Total Request (Rounded)				80
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the Bowling Alley, Building 7485 and the Community Activities Center, Building 6620. The HVAC system upgrades include the following:				
<ul style="list-style-type: none"> Convert the existing dual duct air handling unit (AHU) serving Building 7485 to a variable-air-volume (VAV) AHU. A variable speed drive (VSD) will be installed to control the supply fan speed. The existing dual duct mixing boxes will be replaced with dual duct VAV terminal units. The existing ductwork will remain. In Building 6620, replace two existing single zone air handling units (AHUs) serving the ballroom and the dining room with VAV AHUs. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Convert the existing multizone AHU serving Building 6620 to a VAV AHU. A VSD will be installed to control the supply fan speed. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. 				
11. REQUIREMENT:				
<p>Project: This Federal Energy Management Program (FEMP) project will convert the existing dual duct AHU in Building 7485 to a dual duct VAV AHU. This project will also replace the existing single zone AHUs in Building 6620 with VAV AHUs and convert the existing multizone AHU to a VAV AHU.</p> <p>Requirement: This project is required to reduce natural gas and electrical energy consumption by replacement of existing single zone AHUs with VAV AHUs, by conversion of a dual duct AHU to a dual duct VAV AHU, and by conversion of a multizone AHU to a VAV AHU. An immediate utility savings would be recognized.</p> <p>Current Situation: The Bowling Alley, Building 7485, is a 36,970 sq ft single story building with the bowling lanes heated and cooled by a dual duct AHU. The Community Activities Center, Building 6620, is a 31,740 sq ft two story building with the ballroom and dining room heated and cooled by single zone AHUs, and an office administration area heated and cooled by a multizone AHU.</p>				

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA		2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			
4. PROJECT TITLE Upgrade HVAC Systems in Bowling Alley and Community Activities Center		5. PROJECT NUMBER	
<p>11. REQUIREMENT (continued):</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 1,039 MBtu/yr (1,095,106 MJ/yr) cannot be achieved. The Army will not realize a \$14,661 annual energy dollar savings with a 4.65 year simple payback and a savings-to-investment ratio (SIR) of 3.41. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 1,039 MBtu per year (1,095,106 MJ/yr).</p>			

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION: Fort Riley REGION: 2 (Kansas) PROJECT NO: 1406-005
PROJECT TITLE: Upgrade HVAC Systems in Bowling Alley and Community Activiti FISCAL YEAR: 1995
ANALYSIS DATE: 05/22/95 ECONOMIC LIFE: 20 PREPARED BY: A. Niemeyer

Building 7485 - Convert existing DD AHU to a DD VAV AHU; Building 6620 - Replace existing

1. INVESTMENT: Building 6620 - Replace existing SZ AHUs with VAV AHUs, and Convert existing MZ AHU to a VAV AHU

A. CONSTRUCTION COST	=	\$67,449
B. SIOH COST	(5.5% of 1A) =	\$3,710
C. DESIGN COST	(6.0% of 1A) =	\$4,047
D. TOTAL COST	(1A + 1B + 1C) =	\$75,206
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$75,206

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	1,142	\$13,818	15.88	\$219,433
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(103)	(\$424)	18.30	(\$7,766)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$1,267	14.88	\$18,853
F. TOTAL		1,039	\$14,661	----->	\$230,520

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$30,326	5	0.863	\$26,171
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$30,326			\$26,171

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$26,171

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$16,177

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 4.65

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$256,692

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 3.41
(MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 4

Upgrade HVAC Systems in Bowling Alley and Community Activities Center

Bowling Alley - Building 7485
Community Activities Center - Building 6620

Backup Data

**LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)**

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 6620 - Replace SZs AHUs w/ VAV AHUs					
A. CONSTRUCTION COST	=		\$42,220		
B. SIOH COST	(5.5% of 1A) =		\$2,322		
C. DESIGN COST	(6.0% of 1A) =		\$2,533		
D. TOTAL COST	(1A + 1B + 1C) =		\$47,075		
E. SALVAGE VALUE OF EXISTING EQUIPMENT =			\$0		
F. PUBLIC UTILITY COMPANY REBATE =			\$0		
G. TOTAL INVESTMENT	(1D -1E -1F) =			----->	\$47,075
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	478	\$5,778	15.88	\$91,760
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	199	\$821	18.30	\$15,016
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$539	14.88	\$8,016
F. TOTAL		677	\$7,138	----->	\$114,793
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+)	YEAR OF COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$30,326		5	0.863	\$26,171
b.					\$0
c.					\$0
d.					\$0
e.					\$0
f. TOTAL	\$30,326				\$26,171
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)		(3A4 + 3Bf4) =			\$26,171
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bf1/Economic Life))		\$8,654
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)			(1G/4) =		5.44
6. TOTAL NET DISCOUNTED SAVINGS			(2F5 + 3C) =		\$140,964
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)			(6/1G) =		2.99

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 6620							SHEET 1 OF 1		
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST	Hours/ Unit	Total	Total
1	2	PROPOSED SYSTEM MODIFICATIONS							
3	4	NEW SYSTEMS INSTALLATION	EA.	2.0	\$4,820.78	\$9,642	Q-6	44.44	\$1,787
4	AHU10000	10,000 CFM AHU, COOLING ONLY	EA.	2.0	\$193.80	\$388	Q-5	3.96	\$154
5	REHEAT4	REHEAT COIL, 2ROW, 3' x 2'	EA.	2.0	\$154.07	\$308	Q-5	1.3	\$51
6	REHEAT3	REHEAT COIL, 2ROW, 3'x1'	EA.	2.0	\$310.08	\$620	1-SHEE	1.48	\$62
7	VAVBX35	VAV BOX, 3500 CFM, ELEC	EA.	2.0	\$353.69	\$707	1-SHEE	2.6	\$108
8	VAVBX70	VAV BOX, 7000 CFM, ELEC	EA.	2.0	\$2.10	\$305	Q-1	0.151	\$425
9	STLPIP1	STEEL PIPE SCH. 40, 1" WHANGERS	L.F.	145.0	\$5.28	\$634	Q-15	0.34	\$791
10	STLPIP2.5	STEEL PIPE SCH. 40, 2.5" WHANGERS	L.F.	120.0	\$47	\$61			\$1,425
11		FITTINGS, 5%	C.L.F.	4.0	\$24.23	\$97	1-ELEC	0.8	\$67
12	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	3.0	\$7.41	\$22	1-ELEC	0.73	\$46
13	WIRE#12	COPPER WIRING #12	EA.	2.0	\$2,728.70	\$5,457	1-ELEC	12.5	\$523
14	VSD7.5	VARIABLE SPEED DRIVE W/ CONTRLER, 7.5HP	EA.	4.0	\$153.10	\$612	1-PLUM	0.44	\$38
15	CNTV0.75	CONTROL VALVE 3/4"	EA.	2.0	\$397.29	\$795	1-PLUM	0.889	\$38
16	CNTV2	CONTROL VALVE 2"	EA.	145.0	\$0.62	\$90	Q-14	0.073	\$195
17	INSLPIP1	1" FIBERGLASS PIPE INSULATION, 1" THICK	L.F.	120.0	\$1.60	\$192	Q-14	0.089	\$197
18	INSLPIP2.5	2.5" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	425.0	\$0.47	\$198	Q-10	0.098	\$809
19	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	S.F.	356.0	\$0.83	\$297	Q-14	0.053	\$347
20	DTINSL2"	DUCT INSULATION, 2" THICK							\$644
21									
22									
23									
24									
25									
26									
27		EXISTING SYSTEMS DEMOLITION	TON	3.7			Q-5	17.778	\$1,275
28		AHU DEMO							
29									
30									
31		SUBTOTAL							
32	OH	OVERHEAD							
33	PRO	PROFIT							
34	CONT	CONTINGENCY							
35		TOTAL COST							

DATE PREPARED 22-May-95
 ESTIMATOR C. Wohlert
 CHECKED BY A. Niemeyer

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.

Denver, CO

SHEET 1 OF 1						
			DATE PREPARED		22-May-95	
			ESTIMATOR		C. Wohlert	
			CHECKED BY		A. Niemeier	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	TOTAL
5	6	BUILDING 6620	Unit Cost	Total	Crew/ Worker	Hours/ Unit
1	2	ANNUAL RECURRING	Quantity			
3	4	ANNUAL MAINTENANCE COST - BASELINE				
5	6					
7	8					
9	10					
11	12					
13	14					
15	16	TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0		\$0
17	18	ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT				
19	20					
21	22					
23	24					
25	26					
27	28					
29	30	TOTAL ANNUAL MAINTENANCE COST - BASELINE		\$0		\$0
31	32					
33	34					
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS		\$0		\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER EMC Engineers, Inc.
 Denver, CO

BUILDING 6620							SHEET 1 OF 1
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST	TOTAL
1		BUILDING 6620					
2		NON-RECURRING					
3		EXISTING SYSTEM REPLACEMENT					
4	AHUH10000	10,000 CFM AHU	EA.	2.0	\$5,784.93	\$11,570	46.67
5	STLPIP2.5	STEEL PIPE SCH. 40, 2.5" W/HANGERS	L.F.	120.0	\$5.28	\$634	0.34
6		FITTINGS, 5%			\$32		
7	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	0.8
8	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	1-ELEC	0.73
9	CNTV2	CONTROL VALVE 2"	EA.	4.0	\$397.29	1-PLUM	0.889
10	INSLPIP2.5	2.5" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	120.0	\$1.60	\$192	Q-14
11	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	350.0	\$0.47	\$163	Q-10
12	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	250.0	\$0.83	\$208	Q-14
13							0.053
14							\$244
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26		EXISTING SYSTEMS DEMOLITION					
27		AHU DEMO	TON	3.7			
28					Q-5	17.78	\$1,275
29							
30							
31		SUBTOTAL					
32	OH	OVERHEAD					\$5,223
33	PRO	PROFIT					\$877
34	CONT	CONTINGENCY					\$610
35		TOTAL COST					\$1,342
							\$8,052
							\$30,326

DATE PREPARED 22-May-95
 ESTIMATOR C. Wohlert
 CHECKED BY A. Niemeyer

**LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)**

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 6620 - Convert MZ AHU to VAV AHU					
A.	CONSTRUCTION COST	=		\$11,727	
B.	SIOSH COST	(5.5% of 1A) =		\$645	
C.	DESIGN COST	(6.0% of 1A) =		\$704	
D.	TOTAL COST	(1A + 1B + 1C) =		\$13,076	
E.	SALVAGE VALUE OF EXISTING EQUIPMENT =			\$0	
F.	PUBLIC UTILITY COMPANY REBATE =			\$0	
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =		----->	\$13,076
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	176	\$2,129	15.88	\$33,807
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(9)	(\$35)	18.30	(\$641)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			(\$122)	14.88	(\$1,808)
F. TOTAL		167	\$1,972	----->	\$31,358
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1	ANNUAL MAINTENANCE		\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST		\$0		\$0
B. NON-RECURRING (+/-)					
ITEM					
SAVINGS (+) COST(-) (1) YEAR OF OCCURRENCE (2) DISCOUNT FACTOR (3) DISCOUNTED SAVINGS/COST (4) (TABLE A-2)					
a.	BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.					\$0
c.					\$0
d.					\$0
e.					\$0
f.	TOTAL	\$0			\$0
C.	TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =			\$0
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bf1/Economic Life))		\$1,972
5.	SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =			6.63
6.	TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =			\$31,358
7.	DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)	(6/1G) =			2.40

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						
				DATE PREPARED 22-May-95		
				ESTIMATOR C. Wohlert		
				CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	TOTAL
1	2	BUILDING 6620 PROPOSED SYSTEM MODIFICATIONS	Quantity	Unit Cost	Total	Crew/ Worker Hours/ Unit Total
3	4	MZ AHU CONVERSION TO VAV	EA.	\$266.48	\$533	0.98 \$41
5	VAVBX5	VAV BOX, 500 CFM, ELEC	EA.	\$269.38	\$269	1.0 \$21
6	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	\$279.07	\$558	1.22 \$51
7	VAVBX20	VAV BOX, 2000 CFM, ELEC	EA.	\$310.08	\$620	1.38 \$62
8	VAVBX35	VAV BOX, 3500 CFM, ELEC	EA.	\$24.23	\$170	1-ELEC 0.8 \$117
9	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	\$7.41	\$26	1-ELEC 0.73 \$53
10	WIRE#12	COPPER WIRING #12	C.L.F.	\$2,728.70	\$2,729	1-ELEC 12.5 \$262
11	VSD7.5	VARIABLE SPEED DRIVE W/ CONTROLLER, 7.5HP	EA.	\$69.77	\$70	1-STPI 0.5 \$11
12	ELE-SWIT	DDC SWITCH	EA.	\$0.47	\$140	Q-10 0.094 \$548
13	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	\$0.83	\$208	Q-14 0.053 \$244
14	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	\$96.90	\$678	1-ELEC 0.36 \$51
15	ACTUAT	SMALL ELECTRIC ACTUATOR	EA.			
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26		EXISTING SYSTEMS DEMOLITION SELECTIVE DUCT DEMOLITION	LB	300.0	Q-5	0.025 \$145
27						
28						
29						
30						
31		SUBTOTAL				
32	OH	OVERHEAD				
33	PRO	PROFIT				
34	CONT	CONTINGENCY				
35		TOTAL COST				

\$6,001	\$1,008	\$1,086	\$7,606
17%	10%	20%	\$1,278
			\$888
			\$1,955
			\$11,727

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7485 - Convert DD AHUs to DDs with VAV Units

A. CONSTRUCTION COST	=	\$13,502
B. SIOH COST	(5.5% of 1A) =	\$743
C. DESIGN COST	(6.0% of 1A) =	\$810
D. TOTAL COST	(1A + 1B + 1C) =	\$15,055
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$15,055

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	488	\$5,907	15.88	\$93,805
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(293)	(\$1,205)	18.30	(\$22,055)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$850	14.88	\$12,642
F. TOTAL		196	\$5,552	----->	\$84,392

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$5,552

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 2.71

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$84,392

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)
(MUST HAVE SIR > 1.25 TO QUALIFY) (6/1G) = 5.61

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

ENGINEER'S OPINION OF PROBABLE COST			SHEET	1	OF	1
PROJECT	Fort Riley Feasibility Study for HVAC Upgrade		DATE PREPARED	22-May-95		
ENGINEER	E M C Engineers, Inc. Denver, CO		ESTIMATOR	C. Wohlert		
CHECKED BY			A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST
					Crew/ Worker	Hours/ Unit
					Total	Total
						TOTAL
1	2	BUILDING 7485 PROPOSED SYSTEM MODIFICATIONS				
3	VSD20	VARIABLE SPEED DRIVE W/ CONTROLLER, 20HP	EA.	1	\$4,844.03	1-ELEC
4	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	12	\$24.23	1-ELEC
5	WIRE#12	COPPER WIRING #12	C.L.F.	8	\$7.41	1-ELEC
6	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	19	\$331.40	1-SHEE
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24		EXISTING SYSTEMS DEMOLITION DUAL DUCT MIXING BOX DEMO				
25						
26						
27						
28						
29						
30						
31		SUBTOTAL			\$6,650	\$2,108
32		OVERHEAD			\$1,117	\$354
33		PROFIT			\$777	\$246
34		CONTINGENCY			\$1,709	\$542
35		TOTAL COST			\$10,252	\$3,250

FEMP Project No. 5

Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool
Admin, and Battalion Headquarters

Fire Station - Building 5000

Unit Chapel - Building 7086

Motor Pool Admin - Building 7178

Battalion Headquarters - Building 7806

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		4. PROJECT TITLE Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin and Battalion Headquarters		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin, and Battalion Headquarters	LS			97
TOTAL CONTRACT COST				<u>97</u>
SIOH (5.5%)				5
DESIGN COST (6.0%)				<u>6</u>
TOTAL PROJECT COST				108
Total Request (Rounded)				110
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the Fire Station - Building 5000, the Unit Chapel - Building 7086, the Motor Pool Admin - Building 7178, and the Battalion Headquarters - Building 7806. The HVAC system upgrades include the following:				
<ul style="list-style-type: none"> Replace the existing multizone air handling unit (AHU) serving Building 5000 with three furnace air conditioning units (FACs). The supply air ductwork will be modified to serve three zones instead of the existing five zones. The existing air cooled condensing unit (ACCU) will be replaced with three ACCUs each serving the FACs. The existing boiler will be replaced with a smaller modular HW boiler, and will serve the heating and ventilating unit only. Replace the existing single zone AHU serving Building 7086 with a variable-air-volume (VAV) AHU. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Replace three existing window air conditioners (WACs) serving Building 7178 with a single zone AHU. Supply air ductwork with supply grilles will be installed. An ACCU will be installed to provide cooling to the single zone AHU. Replace two existing single zone AHUs serving Building 7806 with VAV AHUs. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. 				
11. REQUIREMENT: <u>Project:</u> This Federal Energy Management Program (FEMP) project will replace the existing multizone AHU in Building 5000 with three FACs. Also in Building 5000, the existing ACCU will be replaced with three smaller ACCUs, and the HW boiler will be replaced with a smaller HW boiler. This project will also replace the existing single zone AHU in Building 7086 with a VAV AHU; replace three WACs with a single zone AHU and an ACCU in Building 7178; and replace two single zone AHUs with VAV AHUs in Building 7806.				

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA		2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			
4. PROJECT TITLE Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin and Battalion Headquarters		5. PROJECT NUMBER	
<p>11. REQUIREMENT (continued):</p> <p>Requirement: This project is required to reduce natural gas and electrical energy consumption by replacement of a multizone AHU with three FACs; by replacement of an existing ACCU with three smaller ACCUs and an existing HW boiler with a smaller modular HW boiler; by replacement of three WACs with a single zone AHU and ACCU; and by replacement of existing single zone AHUs with VAV AHUs. An immediate utility savings would be recognized.</p> <p>Current Situation: The Fire Station, Building 5000, is a 8,400 sq ft single story building with the quarters and communication center heated and cooled by a multizone AHU. The Unit Chapel, Building 7086, is a 8,700 sq ft single story building with the church sanctuary heated and cooled by a single zone AHU. The Motor Pool Admin, Building 7178, is a 2,480 sq ft single story building cooled by three WACs. The Battalion Headquarters, Building 7806 is a 13,490 sq ft single story building heated and cooled by two single zone AHUs.</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 712 MBtu/yr (750,448 MJ/yr) cannot be achieved. The Army will not realize a \$8,533 annual energy dollar savings with a 7.36 year simple payback and a savings-to-investment ratio (SIR) of 2.23. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 712 MBtu per year (750,448 MJ/yr).</p>			

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION: Fort Riley REGION: 2 (Kansas) PROJECT NO: 1406-005
 PROJECT TITLE: Upgrade HVAC Systs in Fire Stn, Chpl, Mtr Pl Admin, and Bn HQ FISCAL YEAR: 1995
 ANALYSIS DATE: 05/24/95 ECONOMIC LIFE: 20 PREPARED BY: A. Niemeyer

**Building 5000 - Replace existing MZ AHU with FACs, also replace ACCU with three smaller ACCUs
 and replace HW boiler with smaller modular HW boiler;**

Building 7086 - Replace SZ AHU with VAV AHU;

Building 7178 - Replace three WACs with SZ AHU and ACCU;

Building 7806 - Replace SZ AHUs with VAV AHUs

1. INVESTMENT:

A. CONSTRUCTION COST	=	\$96,904
B. SIOH COST	(5.5% of 1A) =	\$5,330
C. DESIGN COST	(6.0% of 1A) =	\$5,814
D. TOTAL COST	(1A + 1B + 1C) =	\$108,048
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$108,048

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	489	\$5,917	15.88	\$93,960
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	223	\$919	18.30	\$16,813
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$1,697	14.88	\$25,251
F. TOTAL		712	\$8,533	----->	\$136,025

3. NON-ENERGY SAVINGS (+) OR COST (-):

A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE		\$511	14.88	\$7,604	
2		\$0	14.88	\$0	
3		\$0	14.88	\$0	
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST		\$511		\$7,604	
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$112,934	5	0.863	\$97,462	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$112,934			\$97,462	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =			\$105,066	
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)		(2F3 + 3A4 + (3Bf1/Economic Life))		\$14,690	
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =			7.36	
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =			\$241,091	
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)	(6/1G) =			2.23	

FEMP Project No. 5

Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin, and
Battalion Headquarters

Fire Station - Building 5000

Unit Chapel - Building 7086

Motor Pool Admin - Building 7178

Battalion Headquarters - Building 7806

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: **BLDG 5000 - Replace MZ AHU w/ 3 Furnace Air Conditioning Units**

A. CONSTRUCTION COST	=	\$37,026
B. SIOH COST	(5.5% of 1A) =	\$2,036
C. DESIGN COST	(6.0% of 1A) =	\$2,222
D. TOTAL COST	(1A + 1B + 1C) =	\$41,284
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$41,284

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	82	\$991	15.88	\$15,737
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	196	\$808	18.30	\$14,793
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			(\$47)	14.88	(\$701)
F. TOTAL		278	\$1,752	----->	\$29,829

3. NON-ENERGY SAVINGS (+) OR COST (-)
 - A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$652	14.88	\$9,696
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$652		\$9,696

 - B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$72,986	5	0.863	\$62,987
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$72,986			\$62,987
 - C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$72,683

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$6,053
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 6.82
6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$102,511
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.48
(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						
			DATE PREPARED 22-May-95			
			ESTIMATOR C. Wohlert			
			CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	TOTAL
1	2	BUILDING 5000 ANNUAL RECURRING	Quantity	Unit Cost	Total	Crew/ Worker Hours/ Unit Total
3	4	ANNUAL MAINTENANCE COST - BASELINE				
4	MNT-BLR	MAINT. ON BOILERS - <2.5 MBH	EA.	1.0	\$48.45	
5	MNT-AHU	MAINT. ON AHU - INSPEC. / YR > 5000 CFM	EA.	1.0		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	\$48	
16	17	ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT				
18	MNT-FAC	MAINT. ON FAC - INSPEC. / YR	EA.	3.0		
19			0			
20						
21						
22						
23						
24						
25						
26						
27						
28						
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	\$0	
30						
31						
32						
33						
34						
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	\$48	
						\$241
						\$241
						\$603
						\$652

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1						
			DATE PREPARED		22-May-95	
			ESTIMATOR		C. Wohlert	
			CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST	TOTAL
1		BUILDING 5000 NON-RECURRING				
2						
3						
4		BASELINE - EXISTING EQUIP. REPLACEMENT				
5	HWBLR1	765 MBH HOT WATER BOILER (Cast Iron)	EA.	1.0	\$5,354	\$5,354
6	MZ15TON	15 TON MULTIZONE AHU	EA.	1.0	\$31,115	\$31,115
7	ACCU15	15 TON ACCU	EA.	1.0	\$5,184	\$5,184
8						
9						
10						
11						
12						
13		EXISTING SYSTEMS DEMOLITION				
14		BOILER DEMOLITION	EA.	1.0		
15		MZ AHU DEMOLITION	TON	1.0		
16		ACCU DEMOLITION	TON	0.8		
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31		SUBTOTAL				
32	OH	OVERHEAD				
33	PRO	PROFIT				
34	CONT	CONTINGENCY				
35	TOTAL COST					

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION:	2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade			FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7086 - Replace Existing SZ w/ VAV AHU w/Reheat					
A. CONSTRUCTION COST	=			\$17,292	
B. SIOH COST	(5.5% of 1A) =			\$951	
C. DESIGN COST	(6.0% of 1A) =			\$1,037	
D. TOTAL COST	(1A + 1B + 1C) =			\$19,280	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =				\$0	
F. PUBLIC UTILITY COMPANY REBATE =				\$0	
G. TOTAL INVESTMENT	(1D - 1E - 1F) =			----->	\$19,280
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:					
				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	92	\$1,108	15.88	\$17,591
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	122	\$504	18.30	\$9,223
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$183	14.88	\$2,719
F. TOTAL		214	\$1,794	----->	\$29,533
3. NON-ENERGY SAVINGS (+) OR COST (-):					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			\$0	14.88	\$0
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)			\$0		\$0
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$12,554	5	0.863	\$10,834	
b.				\$0	
c.				\$0	
d. TOTAL	\$12,554			\$10,834	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)			(3A4 + 3Bd4) =		\$10,834
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bd1/Economic Life))		\$2,422
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)			(1G/4) =		7.96
6. TOTAL NET DISCOUNTED SAVINGS			(2F5 + 3C) =		\$40,367
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)			(6/1G) =		2.09

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

				SHEET 1 OF 1	
				DATE PREPARED 22-May-95	
				ESTIMATOR C. Wohlert	
		CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST	LABOR COST
1	2	BUILDING 7086	Quantity	Unit Cost	Total
3	4	PROPOSED SYSTEM MODIFICATIONS		Crew/ Worker	Hours/ Unit
5	AHU5400	NEW SYSTEMS INSTALLATION 5,400 CFM AHU, COOLING ONLY	EA.	\$3,803.33	Q-6
6	VSD3	VARIABLE SPEED DRIVE W/ CONTRLER,3HP	EA.	\$2,238.39	1-ELEC
7	VAVBX35	VAV BOX, 3500 CFM, ELEC	EA.	\$310.08	1-SHEE
8	REHEAT3	REHEAT COIL, 2ROW, 3'x1'	EA.	\$154.07	Q-5
9	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	\$24.23	1-ELEC
10	WIRE#12	COPPER WIRING #12	CL.F.	\$7.41	1-ELEC
11	STLPIP1	STEEL PIPE SCH. 40, 1" W/HANGERS	L.F.	\$2.10	Q-1
12		FITTINGS, 5%	L.F.	\$11	0.151
13	CNTV1	CONTROL VALVE 1"	EA.	\$190.89	1-PLUM
14	INSLPIP1	1" FIBERGLASS PIPE INSULATION, 1" THICK	L.F.	\$0.62	Q-14
15	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	\$0.47	Q-10
16	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	\$0.83	Q-14
17				\$250	0.053
18					
19					
20					
21					
22					
23		EXISTING SYSTEM DEMOLITION AHU DEMOLITION	TON	1.0	Q-5
24					17.778
25					\$345
26					
27					
28					
29					
30					
31		SUBTOTAL			
32	OH	OVERHEAD			
33	PRO	PROFIT			
34	CONT	CONTINGENCY			
35		TOTAL COST			

\$8,188	17%	\$3,028	\$11,216
\$1,376	10%	\$509	\$1,884
\$956	20%	\$354	\$1,310
\$2,104		\$778	\$2,882
\$12,624		\$4,668	\$17,292

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

		SHEET 1 OF 1	
		DATE PREPARED 22-May-95	
		ESTIMATOR C. Wohlert	CHEKED BY A. Niemeyer
Line No.	Item Refer Code	Item Description	
		Unit of Measure	MATERIAL COST
		Quantity	Unit Cost Total
			LABOR COST
			Crew/ Worker Hours/ Unit Total
1	2	BUILDING 7086	
3	4	ANNUAL RECURRING	
5	6	ANNUAL MAINTENANCE COST - BASELINE	
7	8		
9	10		
11	12		
13	14		
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	\$0 - \$0
16	17	ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT	
18	19		
20	21		
22	23		
24	25		
26	27		
28	29	TOTAL ANNUAL MAINTENANCE COST - BASELINE	\$0 - \$0
30	31		
32	33		
34	35	TOTAL ANNUAL MAINTENANCE COST SAVINGS	\$0 \$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

SHEET 1 OF 1						
DATE PREPARED 22-May-95						
ESTIMATOR C. Wohlert						
CHECKED BY A. Niemeyer						
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	MATERIAL COST	LABOR COST
1		BUILDING 7086				
2		NON-RECURRING				
3		NEW SYSTEMS INSTALLATION				
4						
5	AHUh5400	5,400 CFM AHU	EA.	1.0	\$4,563.99	\$4,564
6	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24
7	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11
8	STLPIP1	STEEL PIPE SCH 40, 1" WI/HANGERS	L.F.	60.0	\$2.10	\$126
9		FITTINGS, 5%				
10	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382
11	INSLPIP1	1" FIBERGLASS PIPE INSULATION, 1" THICK	L.F.	60.0	\$0.62	\$37
12	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	500.0	\$0.47	\$233
13	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	300.0	\$0.83	\$250
14						
15						
16						
17						
18						
19						
20						
21						
22		EXISTING SYSTEM DEMOLITION				
23		AHU DEMOLITION				
24						
25						
26						
27						
28						
29						
30						
31		SUBTOTAL			\$5,633	\$633
32	OH	OVERHEAD			\$946	\$946
33	PRO	PROFIT			\$658	\$658
34	CONT	CONTINGENCY			\$1,448	\$1,448
35		TOTAL COST			\$8,685	\$8,685

\$8,142
 \$1,368
 \$951
 \$2,092
 \$12,554

\$2,509
 \$422
 \$293
 \$645
 \$3,868

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7178 - Replace 3 Window ACs w/ 1SZ AHU					
A. CONSTRUCTION COST	=			\$11,220	
B. SIOH COST	(5.5% of 1A) =			\$617	
C. DESIGN COST	(6.0% of 1A) =			\$673	
D. TOTAL COST	(1A + 1B + 1C) =			\$12,511	
E. SALVAGE VALUE OF EXISTING EQUIPMENT =				\$0	
F. PUBLIC UTILITY COMPANY REBATE =				\$0	
G. TOTAL INVESTMENT	(1D -1E -1F) =			----->	\$12,511
2. ENERGY SAVINGS (+) OR COST (-):					
DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS: <u>JAN '95</u>					
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	52	\$628	15.88	\$9,967
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	0	\$0	18.30	\$0
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$826	14.88	\$12,293
F. TOTAL		52	\$1,454	----->	\$22,259
3. NON-ENERGY SAVINGS (+) OR COST (-)					
A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE			(\$141)	14.88	(\$2,094)
2			\$0	14.88	\$0
3			\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST			(\$141)		(\$2,094)
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)	
a. BASELINE EQUIP. REPLCMNT.	\$4,071	5	0.863	\$3,513	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$4,071			\$3,513	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)			(3A4 + 3Bf4) =		\$1,419
4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)					
			(2F3 + 3A4 + (3Bf1/Economic Life))		\$1,517
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)			(1G/4) =		8.25
6. TOTAL NET DISCOUNTED SAVINGS			(2F5 + 3C) =		\$23,679
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (MUST HAVE SIR > 1.25 TO QUALIFY)			(6/1G) =		1.89

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
 Denver, CO

BUILDING 7178 PROPOSED SYSTEM MODIFICATIONS							MATERIAL COST			LABOR COST			SHEET 1 OF 1	
Line No.	Item Refer Code	Item Description		Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	Total	DATE PREPARED 22-May-95 ESTIMATOR C. Wohlert CHECKED BY A. Niemeyer		
1														
2														
3														
4	AHUh1300	1,300 CFM AHU	EA.	1.0	\$2,296.53	\$2,297	Q-5	13.9965	0.348	\$271	\$2,568			
5	12X6SA	12X6 SA GRILLES	EA.	6.0	\$9.84	\$59	1-SHEE			\$43	\$102			
6	DUCT500	GAL STEEL DUCTWORK, 200 TO 500 LB.	LB.	132.0	\$0.47	\$61	Q-10	0.098		\$251	\$313			
7	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8		\$17	\$41			
8	WIRE#12	COPPER WIRING #12	C.L.F.	0.5	\$7.41	\$4	1-ELEC	0.727		\$8				
9	ACCU7.5	7.5 TON ACCU	EA.	1.0	\$3,125.03	\$3,125	Q-5	29.091		\$564	\$3,689			
10	CUPIP2	COPPER PIPE TYPE L, 2" W/HANGERS	L.F.	15.0	\$5.96	\$89	1-PLUM	0.19		\$61	\$151			
11	CUPIP0.75	COPPER PIPE TYPE L, 0.75" W/HANGERS	L.F.	15.0	\$1.84	\$28	1-PLUM	0.105		\$34	\$23			
12		VALVES AND FITTINGS ADD 15%								\$9				
13		VALVES AND FITTINGS ADD 15%								\$34				
14		COPPER WIRING #6	C.L.F.	1.0	\$24.71	\$25	1-ELEC	1.231		\$26	\$62			
15	WIRE#6													
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32	OH	SUBTOTAL												
33	PRO	OVERHEAD												
34	CONT	PROFIT												
35	TOTAL COST	CONTINGENCY												

\$1,549
\$260
\$181
\$398
\$2,387

\$7,278
\$1,223
\$850
\$1,870
\$11,220

17%
10%
20%

\$5,729
\$962
\$669
\$1,472
\$8,833

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.
Denver, CO

		SHEET 1 OF 1		DATE PREPARED 22-May-95					
		ESTIMATOR C. Wohlert		CHECKED BY A. Niemeyer					
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST		TOTAL	
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 71178	BLDG 71178						
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4	MNT-FC	MAINT. ON FCS - INSPEC. / YR	EA.	3.0	\$0.00	\$0	Q-6	4	\$241
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE		-	-	\$0	-	-	\$241
16									
17		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
18	MNT-AHU1	MAINT. ON AHU - INSPEC. / YR <= 5000 CFM	EA.	1.0			Q-6	19	\$382
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE		-	-	\$0	-	-	\$382
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS		-	-	\$0	-	-	(\$141)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver CO

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: **BLDG 7806 - Replace SZs AHUs w/ VAV AHUs**

A. CONSTRUCTION COST	=	\$31,366
B. SIOH COST	(5.5% of 1A) =	\$1,725
C. DESIGN COST	(6.0% of 1A) =	\$1,882
D. TOTAL COST	(1A + 1B + 1C) =	\$34,973
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D -1E -1F) =	-----> \$34,973

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	263	\$3,183	15.88	\$50,550
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(95)	(\$392)	18.30	(\$7,181)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$735	14.88	\$10,937
F. TOTAL		168	\$3,526	----->	\$54,306

3. NON-ENERGY SAVINGS (+) OR COST (-)
 - A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

 - B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4) (TABLE A-2)
a. BASELINE EQUIP. REPLCMNT.	\$23,323	5	0.863	\$20,128
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$23,323			\$20,128
 - C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$20,128

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$4,692
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 7.45
6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$74,433
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.13
(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.

Denver, CO

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.

Denver, CO

		SHEET 1 OF 1	
		DATE PREPARED 22-May-95	
		ESTIMATOR C. Wohlert	
		CHECKED BY A. Niemeyer	
Line No.	Item Refer Code	Item Description	MATERIAL COST
		Unit of Measure	Quantity
			Unit Cost
		Total	Crew/ Worker
			Hours/ Unit
			Total
		TOTAL	
1			
2			
3		BUILDING 7806	
4		ANNUAL RECURRING	
5		ANNUAL MAINTENANCE COST - BASELINE	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT	
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	\$0
30			
31			
32			
33			
34			
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER EMC Engineers, Inc.
 Denver, CO

BUILDING 7806			NON-RECURRING			EXISTING SYSTEM REPLACEMENT			FIBERGLASS PIPE INSULATION, 1.5" THCK			CONTROL VALVE 1"			EXISTING SYSTEMS DEMOLITION			AHU DEMO		
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	Crew/ Worker	Hours/ Unit	Total	Crew/ Worker	Hours/ Unit	Total	Crew/ Worker	Hours/ Unit	Total		
1																				
2		BUILDING 7806																		
3		NON-RECURRING																		
4		EXISTING SYSTEM REPLACEMENT																		
5	AHUUH5400	5,400 CFM AHU	EA.	1.0	\$4,563.99	\$4,564	Q-6	31.5	\$633									\$5,197		
6	AHUUH8000	8,000 CFM AHU	EA.	1.0	\$5,319.81	\$5,320	Q-6	42	\$844									\$6,164		
7	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571									\$711		
8	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33									\$82		
9	WIRE#12	COPPER WIRING #12	C.L.F.	0.8	\$7.41	\$6	1-ELEC	0.727	\$11									\$17		
10	STLPIP15	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	120.0	\$2.95	\$353	Q-1	0.2	\$465									\$819		
11		FITTINGS ADD 5%																\$41		
12	INSLPIP125	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	120.0	\$1.40	\$167	Q-14	0.08	\$23									\$344		
13	CNTV1	CONTROL VALVE 1"	EA.	4.0	\$190.89	\$764	1-PLUM	0.471	\$41									\$804		
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22		EXISTING SYSTEMS DEMOLITION																		
23		AHU DEMO																		
24																				
25																				
26																				
27																				
28																				
29																				
30																				
31	OH	SUBTOTAL																		
32	PRO	OVERHEAD																		
33	CONT	PROFIT																		
34	TOTAL COST	CONTINGENCY																		
35																				

SHEET 1 OF 1

DATE PREPARED 22-May-95

ESTIMATOR C. Wohlert

CHECKED BY A. Niemeyer